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Checklist of Helminths of Bats from Mexico and Central America

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Abstract

Based on original data obtained from fieldwork conducted from January 2008 to December 2015 and from previous records from published accounts, an updated checklist of helminth parasites of bats from Mexico and Central America is presented. The checklist has been organized in four ways, first as a helminth-host list in the state of Morelos, second as a helminth-host list with taxonomic and geographic distributional information, third as a bat-helminth list with references, and last, as a summary of the host-helminth association. A total of 105 records and 67 helminth taxa (26 trematodes, 4 cestodes, and 37 nematodes [33 adult and 5 larvae]) in 27 bat species from the families Emballonuridae, Molossidae, Mormoopidae, Natalidae, Phyllostomidae, and Vespertilionidae are presented for Mexico and Central America. Eight species of helminths are unique to Central America and ten species occur in both Mexico and the isthmus. From the helminths recorded in Mexico, 34 helminth species in 19 species of bats are present in the state of Morelos. The helminth diversity represents 58% of the total recorded thus far in Mexico, yet the diversity of bats intensively surveyed for parasites in the country represents roughly 14% of the diversity of chiropterans present. This evidence suggests that these intensive examinations are necessary to complete the helminthological record for bats, especially in areas of high endemism.

Keywords: helminths, trematodes, cestodes, nematodes, bats, Chiroptera, geographical distribution, Mexico

Introduction

Mexico is located in the transition between the Nearctic and Neotropical realms; it features a complex topography and almost all types of climates within its territory. As a consequence this country hosts an enormous biological diversity (Sarukhán et al., 2009). This diversity has been extensively documented for vertebrates, arthropods, and plants (Medellín, 2003; Rzedowski, 2006; Fernández et al., 2014; Trejo-Salazar et al., 2015; Santibáñez-López et al., 2016). With respect to the diversity of invertebrates other than

arthropods, the study of helminths is asymmetrically represented since most studies have focused on fish-dwelling helminths (Salgado-Maldonado, 2006), followed by helminths of reptiles (Paredes-León et al., 2008). In contrast, few records document the diversity of helminths among the 545 species of mammals occurring in the Mexican territory (Ceballos and Arroyo-Cabres, 2012). From that total, only 25 species have been extensively surveyed for helminths across the territory, with sparse records for roughly 135 species of mammals (García-Prieto et al., 2012; Guzmán-Cornejo et al., 2012; Jiménez, 2012). It is apparent that the

inventory of helminths of wild mammals is still incomplete (García-Prieto et al., 2012; García-Prieto et al., 2014). The helminth fauna of vertebrates from Central America shows a similar trend (Rodríguez-Ortiz et al., 2004).

Bats (Order Chiroptera) are one of the most successful groups of mammals, including about 1,100 recognized species worldwide, with 138 occurring in Mexico (Ceballos and Arroyo-Cabral, 2012). Bats are reservoirs to a great number of pathogens including eukaryote, viral, and bacterial organisms that are known etiological agents of disease (Ubelaker et al., 1979; Hayman et al., 2013; Mühldorfer, 2013). The distribution of these parasites and pathogens in bats and their patterns of association are poorly understood (Presley et al., 2015), even when their effects on populations of chiropterans are considered good indicators of stress (Cottontail et al., 2009).

In Mexico, parasitological studies in the Order Chiroptera began in the late 1930s with the report and description of parasites of four species of bats from caves in Yucatan (Chitwood, 1938; Stunkard, 1938). These early records documented the presence of metazoans infecting the Jamaican fruit-eating bat, *Artibeus jamaicensis* Leach, 1821; the Pallas' long-tongued bat, *Glossophaga soricina* (Pallas, 1766); the little small-eared bat, *Micronycteris microtis* Miller, 1898; and the Mexican funnel-eared bat, *Natalus stramineus* Gray 1838 (*N. mexicanus*). The species of helminths recorded include the nematodes *Litomosoides* sp. (= *Litomosoides chitwoodi* Bain et al., 2003), *Bidigiticauda vivipara* Chitwood, 1938, and *Cheiropteranema globocephala* Chitwood, 1938 in the Jamaican fruit-eating bat; *Litomosoides hamletti* Chitwood, 1938 in the Pallas' long-tongued bat *Capillaria* sp. and *Anenterotrema auritum* Stunkard, 1938 (nematode and trematode, respectively) in the little small-eared bat; and the trematodes *Anenterotrema singulare* Stunkard, 1938 and *Parabascus yucatanense* Chitwood, 1938 (= *Parabascoides yucatanensis*) and the nematodes *Tricholeiperia carnegiensis* Chitwood, 1938, *T. pearsei* Chitwood, 1938, and *Seuratium cancellatum* Chitwood, 1943 occurring in the Mexican funnel-eared bat.

Scope

Studies on helminth parasites from bats were continued by Caballero (1939; 1940a,b; 1942a,b; 1943a,b,c), Caballero and Zerecero (1951), García (1995); Pérez-Ponce de León et al. (1996), Guzmán-Cornejo et al. (2003), Falcón-Ordaz et al. (2006), Clarke (2008), Eslava (2005), Peralta-Rodríguez et al. (2012), Caspeta-Mandujano et al. (2013, 2015), and Jiménez et al. (2014). Since 2008 the team of the Laboratorio de Parasitología of the Universidad Autónoma del Estado de Morelos has monitored helminths from bats in the State of Morelos (Martínez, 2009; Peralta, 2009, 2012; Tapia, 2011; Ojeda, 2013; Galindo, 2014; Juárez, 2015; Ramírez, 2015; Ramírez, 2015 and Juárez, pers. comm.). That research was supported by a compilation of records on members of the

Nematoda, Cestoda, and Digenea occurring in bats and published until mid 2016, and included the sparse records generated from studies carried out in Central America. In the present manuscript we present a checklist of bat-dwelling helminths occurring in Mexico and Central America, and emphasize the diversity of helminths recorded in a small territory in central Mexico. The number of new species descriptions generated by this survey suggests that more intensive sampling across Mexico and Central America will assist in discovering new species and characterizing their host and geographic distribution.

Materials and Methods

Using published records and unpublished information obtained from the fieldwork from 2008 to 2015, from 8 localities in the State of Morelos (Table 1; Figure 1), a checklist of the helminth parasites of bats in Mexico was generated. Helminth species are presented in taxonomical order arranged by phylum and then by family, followed by information of their host(s), state of the country of the record(s), site of infection, and reference(s).

A total of 18 bat species belonging to 6 families from 8 localities in the State of Morelos were examined for the presence of helminth parasites from January 2008 to December 2014 (Table 1). The collection of bat hosts was developed in different localities, covering the regions North, Center and South of the state; interestingly, these regions include Nearctic landscapes (i.e., pine and oak forest 2,000 m in elevation) and Neotropical dry forests. Bats were captured under *Licencia de Colector Científico* FAUT-0211 (National Collecting Permit 0211) from the *Secretaría del Medio Ambiente y Recursos Naturales* (SEMARNAT) using mist nets placed near and at the entrances of roosts, such as mines, abandoned houses, occupied vegetation, and over water bodies. Nets were set between 18:00 and 22:00 hours, with the aim of capturing at least 10 individuals per species. Bats were removed from the mist net and placed in individual canvas bags for transport to the laboratory, where they were kept alive until their helminthological examination. This examination did not exceed 24 hr upon capture. Bats were killed following standard recommendations set forth by the American Society of Mammalogists (Sikes et al., 2011). The external surface, viscera, and musculature of each individual bat were examined under a stereomicroscope, and all the helminths encountered were counted (Gardner and Jiménez-Ruiz, 2009). Trematodes, cestodes, and nematodes were fixed in hot neutral 4% formalin. Trematodes and cestodes were used for morphological studies as whole mounts; therefore, the specimens were stained with Mayer's paracarmine, dehydrated using a graded alcohol series, cleared in methyl salicylate, and mounted in Canada balsam. Nematodes were cleared with glycerine for microscopic examination and stored in 70% ethanol.

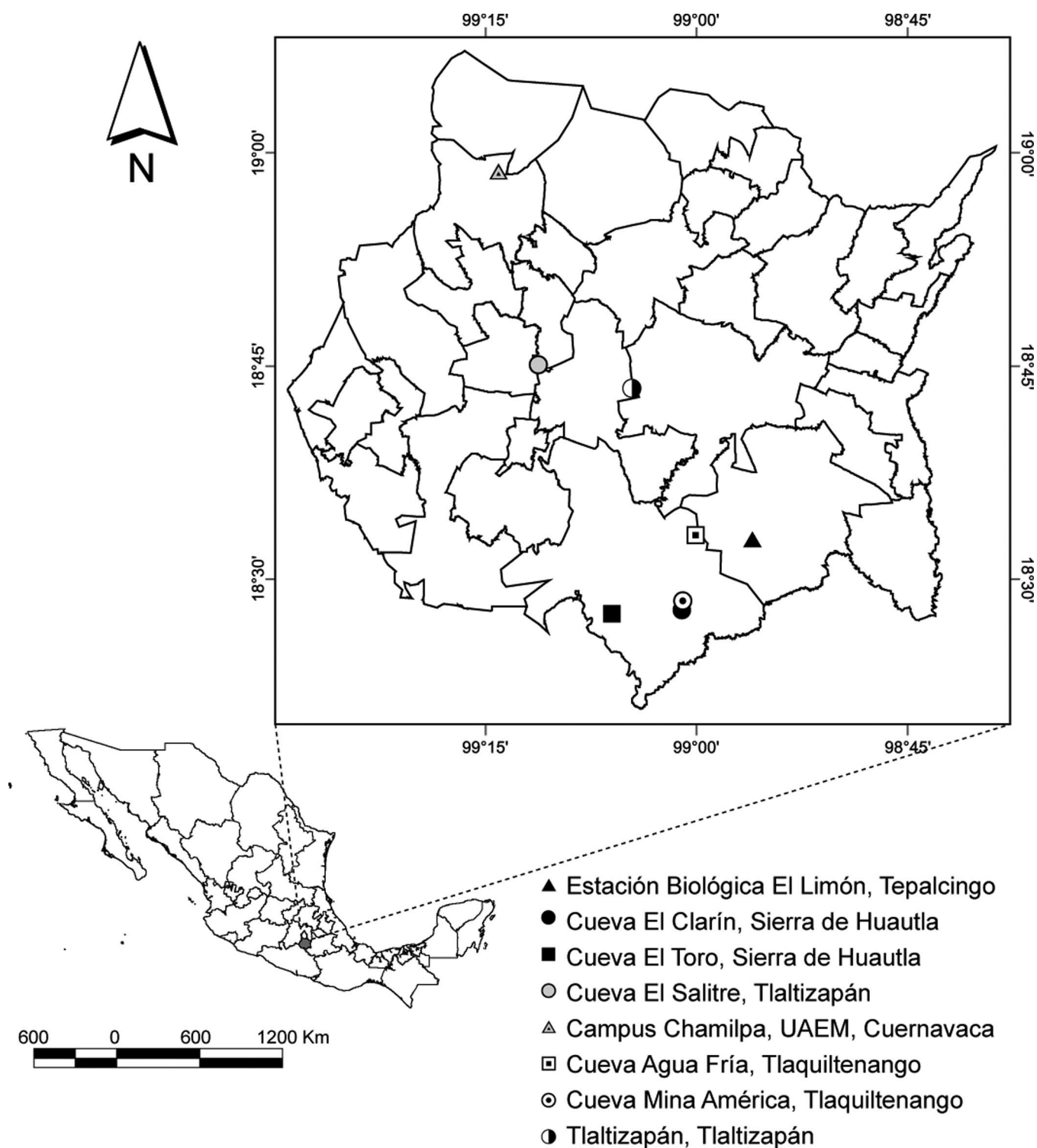


Figure 1. Eight fieldwork localities in the State of Morelos for helminth parasites of bats.

Table 1. List of records of helminth species from bats in Central Mexico from 2008 to 2015, their host(s), locality records in the State of Morelos, site of infection, and references

Helminth	Host(s)	Locality in the State of Morelos	Site of Infection	References
Phylum PLATYHELMINTHES				
Class TREMATODA				
Anchitrema				
<i>Anchitrema sanguineum</i>	<i>Myotis velifer</i>	Cueva El Salitre, Xochitepec	Intestine	Ramírez, 2015
Anenterotrematidae				
<i>Anenterotrema auritum</i>	<i>Leptonycteris yerbabuenae</i>	Cueva Mina América, Tlaquiltenango	Intestine	Juárez, in process
	<i>Mormoops megalophylla</i>	Cueva Mina América, Tlaquiltenango	Intestine	Ramírez, 2015
Dicrocoeliidae				
<i>Dicrocoelium rileyi</i>	<i>Tadarida brasiliensis</i>	Campus UAEM, Chamilpa	Gall-bladder	Martínez, 2009
	<i>Tadarida brasiliensis</i>	Campus UAEM, Chamilpa	Gall-bladder	Peralta, 2012
Lecithodendriidae				
<i>Ochoterenatrema labda</i>	<i>Tadarida brasiliensis</i>	Campus Chamilpa, Cuernavaca	Intestine	Martínez, 2009
	<i>Balantiopteryx plicata</i>	Mina América, Tlaquiltenango	Intestine	Tapia, 2011
	<i>Balantiopteryx plicata</i>	Estación Biológica El Limón, Tepalcingo	Intestine	Tapia, 2011
	<i>Balantiopteryx plicata</i>	Cueva La Presa, Quilamula, Tlaquiltenango	Intestine	Tapia, 2011
	<i>Balantiopteryx plicata</i>	Mina América, Tlaquiltenango	Intestine	Ojeda, 2013
	<i>Balantiopteryx plicata</i>	Mina América, Tlaquiltenango	Intestine	Peralta, 2012
	<i>Balantiopteryx plicata</i>	Estación Biológica El Limón, Tepalcingo	Intestine	Peralta, 2012
	<i>Balantiopteryx plicata</i>	Municipio de Tlaltizapán	Intestine	Peralta, 2012
	<i>Balantiopteryx plicata</i>	Cueva La Presa, Quilamula, Tlaquiltenango	Intestine	Peralta, 2012
	<i>Myotis velifer</i>	Cueva El Salitre, Xochitepec	Intestine	Peralta, 2012
	<i>Myotis velifer</i>	Estación Biológica El Limón, Tepalcingo	Intestine	Peralta, 2012
	<i>Myotis velifer</i>	Cueva Agua Fria, Tlaquiltenango	Intestine	Peralta, 2012
	<i>Mormoops megalophylla</i>	Cueva Mina América, Tlaquiltenango	Stomach	Peralta, 2012
	<i>Mormoops megalophylla</i>	Cueva El Clarín, Huautla	Stomach	Peralta, 2012
	<i>Mormoops megalophylla</i>	Cueva El Salitre, Xochitepec	Stomach	Peralta, 2012
	<i>Mormoops megalophylla</i>	Cueva Mina América, Tlaquiltenango	Intestine	Ramírez, 2015
	<i>Myotis velifer</i>	Cueva El Salitre, Xochitepec	Intestine	Ramírez, 2015
	<i>Tadarida brasiliensis</i>	Campus Chamilpa, Cuernavaca	Intestine	Peralta, 2012
	<i>Myotis velifer</i>	Cueva El Salitre, Xochitepec	Intestine	Peralta, 2012
	<i>Myotis velifer</i>	Estación Biológica El Limón, Tepalcingo	Intestine	Peralta, 2012
	<i>Myotis velifer</i>	Cueva Agua Fria, Tlaquiltenango	Intestine	Peralta, 2012
	<i>Mormoops megalophylla</i>	Cueva Mina América, Tlaquiltenango	Intestine	Ramírez, 2015
<i>Paralecithodendrium scabrum</i>				
Phaneropsolidae				
<i>Limatulum diminutum</i>	<i>Pteronotus parnellii</i>	Cueva Mina América, Tlaquiltenango	Stomach	Peralta, 2009
	<i>Mormoops megalophylla</i>	Cueva Mina América, Tlaquiltenango	Stomach	Ramírez, 2015
	<i>Pteronotus parnellii</i>	Estación Biológica El Limón, Tepalcingo	Stomach	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva Mina América, Tlaquiltenango	Stomach	Peralta, 2012

Table 1. (continued) Records of helminth species from bats in Central Mexico from 2008 to 2015

Helminth	Host(s)	Locality in the State of Morelos	Site of Infection	References
<i>Limatulum gastroides</i>	<i>Pteronotus parnellii</i>	Cueva El Salitre, Xochitepec	Stomach	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva La Presa, Quilamula, Tlaquiltenango	Stomach	Peralta, 2012
	<i>Pteronotus personatus</i>	Cueva Mina América, Tlaquiltenango	Stomach	Peralta, 2012
	<i>Pteronotus davyi</i>	Cueva Mina América, Tlaquiltenango	Stomach	Peralta, 2012
	<i>Pteronotus davyi</i>	Cueva Mina América, Tlaquiltenango	Stomach	Juárez, 2015
	<i>Pteronotus davyi</i>	Cueva Mina América, Tlaquiltenango	Stomach	Peralta, 2012
	<i>Balantiopteryx plicata</i>	Cueva Mina América, Tlaquiltenango	Stomach	Ojeda, 2013
	<i>Balantiopteryx plicata</i>	Cueva Mina América, Tlaquiltenango	Stomach	Peralta, 2012
	<i>Balantiopteryx plicata</i>	Mina América, Tlaquiltenango	Stomach	Peralta, 2012
	<i>Balantiopteryx plicata</i>	Estación Biológica El Limón, Tepalcingo	Stomach	Peralta, 2012
	<i>Balantiopteryx plicata</i>	Municipio de Tlaltizapán	Stomach	Peralta, 2012
	<i>Pteronotus davyi</i>	Cueva La Presa, Quilamula, Tlaquiltenango	Stomach	Peralta, 2012
	<i>Mormoops megalophylla</i>	Cueva Mina América, Tlaquiltenango	Stomach	Juárez, 2015
	<i>Mormoops megalophylla</i>	Cueva Mina América, Tlaquiltenango	Stomach	Peralta, 2012
	<i>Mormoops megalophylla</i>	Cueva El Clarín, Huautla	Stomach	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva El Salitre, Xochitepec	Stomach	Peralta, 2012
	<i>Pteronotus parnellii</i>	Estación Biológica El Limón, Tepalcingo	Stomach	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva Mina América, Tlaquiltenango	Stomach	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva El Salitre, Xochitepec	Stomach	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva La Presa, Quilamula, Tlaquiltenango	Stomach	Peralta, 2012
<i>Limatulum limatulum</i>	<i>Tadarida brasiliensis</i>	Campus UAEM, Chamilpa	Stomach	Martínez, 2012
	<i>Pteronotus parnellii</i>	Cueva El Salitre, Xochitepec	Stomach	Peralta, 2009
	<i>Myotis velifer</i>	Cueva El Salitre, Xochitepec	Stomach	Ramírez, 2015
	<i>Myotis velifer</i>	Cueva El Salitre, Xochitepec	Stomach	Peralta, 2012
	<i>Myotis velifer</i>	Estación Biológica El Limón, Tepalcingo	Stomach	Peralta, 2012
	<i>Myotis velifer</i>	Cueva Agua Fria, Tlaquiltenango	Stomach	Peralta, 2012
	<i>Pteronotus davyi</i>	Mina América, Tlaquiltenango	Stomach	Juárez, 2015
	<i>Mormoops megalophylla</i>	Mina América, Tlaquiltenango	Stomach	Ramírez, 2015
	<i>Pteronotus parnellii</i>	Estación Biológica El Limón, Tepalcingo	Stomach	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva Mina América, Tlaquiltenango	Stomach	Peralta, 2012
<i>Limatulum oklahomense</i>	<i>Pteronotus parnellii</i>	Cueva El Salitre, Xochitepec	Stomach	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva La Presa, Quilamula, Tlaquiltenango	Stomach	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva El Salitre, Xochitepec	Stomach	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva El Salitre, Xochitepec	Stomach	Peralta, 2009
	<i>Pteronotus parnellii</i>	Estación Biológica El Limón, Tepalcingo	Stomach	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva Mina América, Tlaquiltenango	Stomach	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva El Salitre, Xochitepec	Stomach	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva La Presa, Quilamula, Tlaquiltenango	Stomach	Peralta, 2012
	<i>Natalus stramineus</i>	Estación Biológica El Limón, Tepalcingo	Stomach	Peralta, 2012
	<i>Natalus stramineus</i>	Cueva El Clarín, Huautla	Stomach	Peralta, 2012
<i>Limatulum limatulum</i>	<i>Pteronotus davyi</i>	Cueva El Toro, Huautla	Stomach	Peralta, 2012
	<i>Mormoops megalophylla</i>	Cueva Mina América, Tlaquiltenango	Stomach	Juárez, 2015
	<i>Mormoops megalophylla</i>	Cueva Mina América, Tlaquiltenango	Stomach	Ramírez, 2015

Table 1. (continued) Records of helminth species from bats in Central Mexico from 2008 to 2015

Helminth	Host(s)	Locality in the State of Morelos	Site of Infection	References
<i>Parabascus yucatanensis</i>	<i>Mormoops megalophylla</i>	Cueva Mina América, Tlaquiltenango	Intestine	Ramírez, 2015
	<i>Mormoops megalophylla</i>	Cueva Mina América, Tlaquiltenango	Intestine	Peralta, 2012
	<i>Mormoops megalophylla</i>	Cueva El Clarín, Huautla	Intestine	Peralta, 2012
	<i>Mormoops megalophylla</i>	Cueva El Salitre, Xochitepec	Intestine	Peralta, 2012
<i>Tremajoannes buckleyi</i>	<i>Natalus stramineus</i>	Estación Biológica El Limón, Tepalcingo	Intestine	Peralta, 2012
	<i>Natalus stramineus</i>	Cueva El Clarín, Huautla	Intestine	Peralta, 2012
	<i>Natalus stramineus</i>	Cueva El Toro, Huautla	Intestine	Peralta, 2012
	<i>Myotis velifer</i>	Cueva El Salitre, Xochitepec	Intestine	Ramírez, 2015
Plagiorchiidae				
<i>Plagiorchis muris</i>	<i>Pteronotus parnellii</i>	Cueva El Salitre, Xochitepec	Intestine	Peralta, 2009
	<i>Pteronotus parnellii</i>	Estación Biológica El Limón, Tepalcingo	Intestine	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva Mina América, Tlaquiltenango	Intestine	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva El Salitre, Xochitepec	Intestine	Peralta, 2012
<i>Plagiorchis vespertilionis</i>	<i>Pteronotus parnellii</i>	Cueva La Presa, Quilamula, Tlaquiltenango	Intestine	Peralta, 2012
	<i>Myotis velifer</i>	Estación Biológica El Limón, Tepalcingo	Intestine	Peralta, 2012
	<i>Myotis velifer</i>	Cueva Agua Fría, Quilamula, Tlaquiltenango	Intestine	Peralta, 2012
	<i>Myotis velifer</i>	Cueva El Salitre, Xochitepec	Intestine	Peralta, 2012
Urotrematidae				
<i>Urotrema scabridum</i>	<i>Tadarida brasiliensis</i>	Campus UAEM, Chamilpa	Intestine	Martínez, 2009
	<i>Tadarida brasiliensis</i>	Campus UAEM, Chamilpa	Intestine	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva El Salitre, Xochitepec	Intestine	Peralta, 2009
	<i>Balantiopteryx plicata</i>	Mina América, Tlaquiltenango	Intestine	Ojeda, 2013
	<i>Pteronotus davyi</i>	Cueva Mina América, Tlaquiltenango	Intestine	Peralta, 2012
	<i>Pteronotus davyi</i>	Mina América, Tlaquiltenango	Intestine	Juárez, 2015
	<i>Pteronotus personatus</i>	Mina América, Tlaquiltenango	Intestine	Peralta, 2012
	<i>Myotis velifer</i>	Cueva El Salitre, Xochitepec	Intestine	Ramírez, 2015
	<i>Mormoops megalophylla</i>	Mina América, Tlaquiltenango	Intestine	Ramírez, 2015
	<i>Pteronotus parnellii</i>	Estación Biológica El Limón, Tepalcingo	Intestine	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva Mina América, Tlaquiltenango	Intestine	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva El Salitre, Xochitepec	Intestine	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva La Presa, Quilamula, Tlaquiltenango	Intestine	Peralta, 2012
	<i>Balantiopteryx plicata</i>	Mina América, Tlaquiltenango	Intestine	Peralta, 2012
	<i>Balantiopteryx plicata</i>	Estación Biológica El Limón, Tepalcingo	Intestine	Peralta, 2012
	<i>Balantiopteryx plicata</i>	Municipio de Tlaltizapán	Intestine	Peralta, 2012
	<i>Balantiopteryx plicata</i>	Cueva La Presa, Quilamula, Tlaquiltenango	Intestine	Peralta, 2012

Table 1. (continued) Records of helminth species from bats in Central Mexico from 2008 to 2015

Helminth	Host(s)	Locality in the State of Morelos	Site of Infection	References
Class CESTODA				
Hymenolepididae				
<i>Vampirolepis decipiens</i>	<i>Tadarida brasiliensis</i>	Campus UAEM, Chamilpa	Intestine	Martínez, 2009
	<i>Tadarida brasiliensis</i>	Campus UAEM, Chamilpa	Intestine	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva El Salitre, Xochitepec	Intestine	Peralta, 2009
	<i>Balantiopteryx plicata</i>	Cueva La Presa, Quilamula, Tlaquiltenango	Intestine	Tapia, 2011
	<i>Balantiopteryx plicata</i>	Mina América, Tlaquiltenango	Intestine	Tapia, 2011
	<i>Balantiopteryx plicata</i>	Mina América, Tlaquiltenango	Intestine	Peralta, 2012
	<i>Balantiopteryx plicata</i>	Estación Biológica El Limón, Tepalcingo	Intestine	Peralta, 2012
	<i>Balantiopteryx plicata</i>	Municipio de Tlaltizapán	Intestine	Peralta, 2012
	<i>Balantiopteryx plicata</i>	Cueva La Presa, Quilamula, Tlaquiltenango	Intestine	Peralta, 2012
	<i>Balantiopteryx plicata</i>	Cueva Mina América, Tlaquiltenango	Intestine	Ojeda, 2013
	<i>Mormoops megalophylla</i>	Cueva Mina América, Tlaquiltenango	Intestine	Ramírez, 2015
	<i>Mormoops megalophylla</i>	Cueva Mina América, Tlaquiltenango	Intestine	Peralta, 2012
	<i>Mormoops megalophylla</i>	Cueva El Clarín, Huautla	Intestine	Peralta, 2012
	<i>Mormoops megalophylla</i>	Cueva El Salitre, Xochitepec	Intestine	Peralta, 2012
	<i>Myotis velifer</i>	Cueva El Salitre, Xochitepec	Intestine	Ramírez, 2015
	<i>Myotis velifer</i>	Cueva El Salitre, Xochitepec	Intestine	Peralta, 2012
	<i>Myotis velifer</i>	Estación Biológica El Limón, Tepalcingo	Intestine	Peralta, 2012
	<i>Myotis velifer</i>	Cueva Agua Fria, Tlaquiltenango	Intestine	Peralta, 2012
	<i>Natalus stramineus</i>	Estación Biológica El Limón, Tepalcingo	Intestine	Peralta, 2012
	<i>Natalus stramineus</i>	Cueva El Clarín, Huautla	Intestine	Peralta, 2012
	<i>Natalus stramineus</i>	Cueva El Toro, Huautla	Intestine	Peralta, 2012
	<i>Pteronotus parnellii</i>	Estación Biológica El Limón, Tepalcingo	Intestine	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva Mina América, Tlaquiltenango	Intestine	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva El Salitre, Xochitepec	Intestine	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva La Presa, Quilamula, Tlaquiltenango	Intestine	Peralta, 2012
	<i>Balantiopteryx plicata</i>	Cueva La Presa, Quilamula, Tlaquiltenango	Intestine	Peralta, 2012
	<i>Balantiopteryx plicata</i>	Mina América, Tlaquiltenango	Intestine	Tapia, 2011
	<i>Balantiopteryx plicata</i>	Estación Biológica El Limón, Tepalcingo	Intestine	Peralta, 2012
	<i>Balantiopteryx plicata</i>	Municipio de Tlaltizapán	Intestine	Peralta, 2012
	<i>Balantiopteryx plicata</i>	Cueva La Presa, Quilamula, Tlaquiltenango	Intestine	Peralta, 2012
	<i>Dermanura azteca</i>	Campus UAEM, Chamilpa	Intestine	Peralta, 2012
<i>Vampirolepis elongatus</i>	<i>Leptonycteris yerbabuenae</i>	Cueva Mina América, Tlaquiltenango	Intestine	Juárez, in process
	<i>Leptonycteris yerbabuenae</i>	Cueva Mina América, Tlaquiltenango	Intestine	Peralta, 2012
	<i>Leptonycteris yerbabuenae</i>	Estación Biológica El Limón, Tepalcingo	Intestine	Peralta, 2012
	<i>Leptonycteris yerbabuenae</i>	Cueva El Salitre, Xochitepec	Intestine	Peralta, 2012
	<i>Mormoops megalophylla</i>	Cueva Mina América, Tlaquiltenango	Intestine	Ramírez, 2015
	<i>Glossophaga soricina</i>	Cueva Mina América, Tlaquiltenango	Intestine	Peralta, 2012
	<i>Glossophaga soricina</i>	Estación Biológica El Limón, Tepalcingo	Intestine	Peralta, 2012
	<i>Glossophaga soricina</i>	Cueva El Salitre, Xochitepec	Intestine	Peralta, 2012

Table 1. (continued) Records of helminth species from bats in Central Mexico from 2008 to 2015

Helminth	Host(s)	Locality in the State of Morelos	Site of Infection	References
<i>Vampirolepis gertschi</i>	<i>Macrotus waterhousii</i> <i>Mormoops megalophylla</i> <i>Pteronotus parnellii</i> <i>Pteronotus parnellii</i> <i>Pteronotus parnellii</i> <i>Macrotus waterhousii</i> <i>Macrotus waterhousii</i> <i>Macrotus waterhousii</i>	Cueva Mina América, Tlaquiltenango Cueva Mina América, Tlaquiltenango Estación Biológica El Limón, Tepalcingo Cueva Mina América, Tlaquiltenango Cueva El Salitre, Xochitepec Cueva La Presa, Quilamula, Tlaquiltenango Estación Biológica El Limón, Tepalcingo Cueva Mina América, Tlaquiltenango Campus UAEM, Chamilpa	Intestine Intestine Intestine Intestine Intestine Intestine Intestine Intestine Intestine	Galindo, 2014 Ramírez, 2015 Peralta, 2012 Peralta, 2012 Peralta, 2012 Peralta, 2012 Peralta, 2012 Peralta, 2012 Peralta, 2012
Phylum NEMATODA Superfamily TRICHOSTRONGYLOIDEA Ornithostromylidae <i>Allintoshius tadaridae</i>	<i>Myotis velifer</i> <i>Myotis velifer</i> <i>Myotis velifer</i> <i>Myotis velifer</i> <i>Mormoops megalophylla</i>	Cueva El Salitre, Xochitepec Cueva El Salitre, Xochitepec Estación Biológica El Limón, Tepalcingo Cueva Agua Fría, Tlaquiltenango Cueva Mina América, Tlaquiltenango	Intestine Intestine Intestine Intestine Intestine	Ramírez, 2015 Peralta, 2012 Peralta, 2012 Peralta, 2012 Ramírez, 2015
Molineidae <i>Biacantha desmoda</i>	<i>Desmodus rotundus</i> <i>Desmodus rotundus</i> <i>Desmodus rotundus</i> <i>Desmodus rotundus</i> <i>Pteronotus davyi</i> <i>Mormoops megalophylla</i>	Cueva El Salitre, Xochitepec Cueva Mina América, Tlaquiltenango Estación Biológica El Limón, Tepalcingo Cueva Agua Fría, Tlaquiltenango Cueva Mina América, Tlaquiltenango Cueva Mina América, Tlaquiltenango	Intestine Intestine Intestine Intestine Intestine Intestine	Peralta, 2012 Peralta, 2012 Peralta, 2012 Peralta, 2012 Juárez, 2015 Jiménez et al., 2014; Ramírez, 2015
<i>Tadaridanema delicatus</i>	<i>Tadarida brasiliensis</i> <i>Tadarida brasiliensis</i>	Campus UAEM, Chamilpa Campus UAEM, Chamilpa	Intestine Intestine	Martínez, 2009 Peralta, 2012
<i>Torrestrongylus tetradorsalis</i>	<i>Macrotus waterhousii</i> <i>Macrotus waterhousii</i> <i>Macrotus waterhousii</i> <i>Macrotus waterhousii</i>	Mina América, Tlaquiltenango Estación Biológica El Limón, Tepalcingo Cueva Mina América, Tlaquiltenango Campus UAEM, Chamilpa	Intestine Intestine Intestine Intestine	Caspeta-Mandujano et al., 2015 Peralta, 2012 Peralta, 2012 Peralta, 2012
<i>Trichoileiperia carneigensis</i>	<i>Natalus stramineus</i> <i>Natalus stramineus</i> <i>Natalus stramineus</i> <i>Mormoops megalophylla</i> <i>Mormoops megalophylla</i> <i>Mormoops megalophylla</i> <i>Mormoops megalophylla</i>	Estación Biológica El Limón, Tepalcingo Cueva El Clarín, Huautla Cueva El Toro, Huautla Cueva Mina América, Tlaquiltenango Cueva Mina América, Tlaquiltenango Cueva El Clarín, Huautla Cueva El Salitre, Xochitepec	Intestine Intestine Intestine Stomach Stomach Stomach Stomach	Peralta, 2012 Peralta, 2012 Peralta, 2012 Ramírez, 2015 Peralta, 2012 Peralta, 2012 Peralta, 2012

Table 1. (continued) Records of helminth species from bats in Central Mexico from 2008 to 2015

Helminth	Host(s)	Locality in the State of Morelos	Site of Infection	References
<i>Websterinema parnellii</i>	<i>Pteronotus parnellii</i>	Cueva El Salitre, Xochitepec	Intestine	Peralta, 2009
	<i>Pteronotus parnellii</i>	Estación Biológica El Limón, Tepalcingo	Intestine	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva Mina América, Tlaquiltenango	Intestine	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva El Salitre, Xochitepec	Intestine	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva La Presa, Quilamula, Tlaquiltenango	Intestine	Peralta, 2012
Superfamily TRICHINELLOIDEA Capillariidae <i>Monchotheca speciosa</i>	<i>Tadarida brasiliensis</i>	Campus UAEM, Chamilpa	Stomach	Peralta, 2012
	<i>Glossophaga soricina</i>	Cueva Mina América, Tlaquiltenango	Intestine	Peralta, 2012
	<i>Glossophaga soricina</i>	Estación Biológica El Limón, Tepalcingo	Intestine	Peralta, 2012
	<i>Glossophaga soricina</i>	Cueva El Salitre, Xochitepec	Intestine	Peralta, 2012
	<i>Leptonycteris yerbabuenae</i>	Cueva Mina América, Tlaquiltenango	Intestine	Peralta, 2012
	<i>Leptonycteris yerbabuenae</i>	Estación Biológica El Limón, Tepalcingo	Intestine	Peralta, 2012
	<i>Leptonycteris yerbabuenae</i>	Cueva El Salitre, Xochitepec	Intestine	Peralta, 2012
	<i>Leptonycteris yerbabuenae</i>	Cueva Mina América, Tlaquiltenango	Stomach	Juárez, in process
	<i>Macrotus waterhousii</i>	Estación Biológica El Limón, Tepalcingo	Intestine	Peralta, 2012
	<i>Macrotus waterhousii</i>	Cueva Mina América, Tlaquiltenango	Intestine	Peralta, 2012
	<i>Macrotus waterhousii</i>	Campus UAEM, Chamilpa	Intestine	Peralta, 2012
	<i>Dermanura azteca</i>	Campus UAEM, Chamilpa	Intestine	Peralta, 2012
	<i>Myotis velifer</i>	Cueva El Salitre, Xochitepec	Intestine	Peralta, 2012
	<i>Myotis velifer</i>	Estación Biológica El Limón, Tepalcingo	Intestine	Peralta, 2012
	<i>Myotis velifer</i>	Cueva Agua Fria, Tlaquiltenango	Intestine	Peralta, 2012
	<i>Natalus stramineus</i>	Estación Biológica El Limón, Tepalcingo	Intestine	Peralta, 2012
	<i>Natalus stramineus</i>	Cueva El Clarin, Huautla	Intestine	Peralta, 2012
	<i>Natalus stramineus</i>	Cueva El Toro, Huautla	Intestine	Peralta, 2012
	<i>Capillaria palmata</i> <i>Capillaria</i> sp.	<i>Mormoops megalophylla</i>	Cueva Mina América, Tlaquiltenango	Intestine
<i>Mormoops megalophylla</i>		Cueva El Clarin, Huautla	Intestine	Peralta, 2012
<i>Mormoops megalophylla</i>		Cueva El Salitre, Xochitepec	Intestine	Peralta, 2012
<i>Tadarida brasiliensis</i>		Campus UAEM, Chamilpa	Stomach	Martínez, 2009
<i>Desmodus rotundus</i>		Cueva El Salitre, Xochitepec	Intestine	Peralta, 2012
<i>Pterothominx</i> sp.	<i>Desmodus rotundus</i>	Cueva Mina América, Tlaquiltenango	Intestine	Peralta, 2012
	<i>Desmodus rotundus</i>	Estación Biológica El Limón, Tepalcingo	Intestine	Peralta, 2012
	<i>Desmodus rotundus</i>	Cueva Agua Fria, Tlaquiltenango	Intestine	Peralta, 2012
	<i>Pteronotus davyi</i>	Cueva Mina América, Tlaquiltenango	Intestine	Peralta, 2012
	<i>Pteronotus davyi</i>	Cueva Mina América, Tlaquiltenango	Intestine	Juárez, 2015
	<i>Pteronotus parnellii</i>	Cueva El Salitre, Xochitepec	Intestine	Peralta, 2009
	<i>Pteronotus parnellii</i>	Estación Biológica El Limón, Tepalcingo	Intestine	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva Mina América, Tlaquiltenango	Intestine	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva El Salitre, Xochitepec	Intestine	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva La Presa, Quilamula, Tlaquiltenango	Intestine	Peralta, 2012
	<i>Mormoops megalophylla</i>	Cueva Mina América, Tlaquiltenango	Intestine	Ramírez, 2015

Table 1. (continued) Records of helminth species from bats in Central Mexico from 2008 to 2015

Helminth	Host(s)	Locality in the State of Morelos	Site of Infection	References
<i>Trichuroides myoti</i>	<i>Balantiopteryx plicata</i> <i>Balantiopteryx plicata</i> <i>Balantiopteryx plicata</i> <i>Balantiopteryx plicata</i> <i>Myotis velifer</i>	Mina América, Tlaquiltenango Estación Biológica El Limón, Tepalcingo Municipio de Tlaltzapán Cueva La Presa, Quilamula, Tlaquiltenango Cueva El Salitre, Xochitepec	Stomach Stomach Stomach Stomach Stomach	Peralta, 2012 Peralta, 2012 Peralta, 2012 Peralta, 2012 Ramírez, 2015
Superfamily FILARIOIDEA				
Onchocercidae				
<i>Litosomoides guterasi</i>	<i>Pteronotus parnellii</i> <i>Pteronotus parnellii</i> <i>Pteronotus parnellii</i> <i>Pteronotus parnellii</i> <i>Pteronotus parnellii</i> <i>Leptoncycteris yerbabuenae</i> <i>Leptoncycteris yerbabuenae</i> <i>Leptoncycteris yerbabuenae</i> <i>Glossophaga soricina</i> <i>Glossophaga soricina</i> <i>Glossophaga soricina</i> <i>Macrotus waterhousii</i> <i>Mormoops megalophylla</i> <i>Pteronotus parnellii</i> <i>Leptoncycteris yerbabuenae</i>	Cueva El Salitre, Xochitepec Estación Biológica El Limón, Tepalcingo Cueva Mina América, Tlaquiltenango Cueva El Salitre, Xochitepec Cueva La Presa, Quilamula, Tlaquiltenango Cueva Mina América, Tlaquiltenango Cueva El Salitre, Xochitepec Estación Biológica El Limón, Tepalcingo Cueva Mina América, Tlaquiltenango Estación Biológica El Limón, Tepalcingo Cueva El Salitre, Xochitepec Cueva Mina América, Tlaquiltenango Cueva Mina América, Tlaquiltenango Cueva El Salitre, Xochitepec Estación Biológica El Limón, Tepalcingo	Mesentery Mesentery Mesentery Mesentery Mesentery Mesentery Mesentery Mesentery Mesentery Mesentery Mesentery Mesentery Mesentery Mesentery Mesentery Mesentery	Peralta, 2009 Peralta, 2012 Peralta, 2012 Peralta, 2012 Peralta, 2012 Peralta, 2012 Peralta, 2012 Peralta, 2012 Peralta, 2012 Peralta, 2012 Galindo, 2014 Ramírez, 2015 Peralta, 2012 Peralta, 2012
<i>Litosomoides guterasi</i> (as a larva)				
Superfamily PHYSALOPTEROIDEA				
Physalopteridae				
<i>Physaloptera</i> sp. (as a larva)	<i>Mormoops megalophylla</i>	Cueva Mina América, Tlaquiltenango	Mesentery	Ramírez, 2015
Spiruridae				
<i>Spirura mexicana</i>	<i>Pteronotus parnellii</i> <i>Pteronotus parnellii</i> <i>Pteronotus parnellii</i> <i>Pteronotus parnellii</i> <i>Pteronotus parnellii</i> <i>Pteronotus parnellii</i> <i>Pteronotus personatus</i> <i>Pteronotus davyi</i> <i>Pteronotus davyi</i> <i>Mormoops megalophylla</i> <i>Macrotus waterhousii</i> <i>Macrotus waterhousii</i> <i>Macrotus waterhousii</i>	Cueva El Salitre, Xochitepec Cueva El Salitre, Xochitepec Estación Biológica El Limón, Tepalcingo Cueva Mina América, Tlaquiltenango Cueva El Salitre, Xochitepec Cueva La Presa, Quilamula, Tlaquiltenango Mina América, Tlaquiltenango Cueva Mina América, Tlaquiltenango Cueva Mina América, Tlaquiltenango Cueva Mina América, Tlaquiltenango Estación Biológica El Limón, Tepalcingo Cueva Mina América, Tlaquiltenango Campus UAEM, Chamilpa	Esophagus Esophagus Esophagus Esophagus Esophagus Esophagus Esophagus Esophagus Esophagus Esophagus Esophagus Esophagus Esophagus	Peralta, 2009 Peralta et al., 2012 Peralta, 2012 Peralta, 2012 Peralta, 2012 Peralta, 2012 Peralta, 2012 Peralta, 2012 Juárez, 2015 Ramírez, 2015 Galindo, 2014 Peralta, 2012 Peralta, 2012 Peralta, 2012

Table 1. (continued) Records of helminth species from bats in Central Mexico from 2008 to 2015

Helminth	Host(s)	Locality in the State of Morelos	Site of Infection	References
Spiroceridae				
<i>Physcephalus sexalatus</i> (as a larva)	<i>Pteronotus parnellii</i>	Cueva El Salitre, Xochitepec	Mesentery	Peralta, 2009
	<i>Pteronotus parnellii</i>	Estación Biológica El Limón, Tepalcingo	Mesentery	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva Mina América, Tlaquiltenango	Mesentery	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva El Salitre, Xochitepec	Mesentery	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva La Presa, Quilamula, Tlaquiltenango	Mesentery	Peralta, 2012
	<i>Balantiopteryx plicata</i>	Estación Biológica El Limón, Tepalcingo	Mesentery	Tapia, 2011
	<i>Balantiopteryx plicata</i>	Cueva La Presa, Quilamula, Tlaquiltenango	Mesentery	Tapia, 2011
	<i>Balantiopteryx plicata</i>	Mina América, Tlaquiltenango	Mesentery and intestine	Tapia, 2011
	<i>Balantiopteryx plicata</i>	Mina América, Tlaquiltenango	Mesentery	Tapia, 2011
	<i>Balantiopteryx plicata</i>	Estación Biológica El Limón, Tepalcingo	Mesentery	Peralta, 2012
	<i>Balantiopteryx plicata</i>	Municipio de Tlaltizapán	Mesentery	Peralta, 2012
	<i>Balantiopteryx plicata</i>	Cueva La Presa, Quilamula, Tlaquiltenango	Mesentery	Peralta, 2012
	<i>Balantiopteryx plicata</i>	Cueva Mina América, Tlaquiltenango	Mesentery	Ojeda, 2013
	<i>Micronycteris microtis</i>	Cueva Mina América, Tlaquiltenango	Mesentery	Peralta, 2012
	(as <i>Micronycteris megalotis</i>)			
	<i>Micronycteris microtis</i>	Cueva La Presa, Quilamula, Tlaquiltenango	Mesentery	Peralta, 2012
	(as <i>Micronycteris megalotis</i>)			
	<i>Micronycteris microtis</i>	Estación Biológica El Limón, Tepalcingo	Mesentery	Peralta, 2012
	(as <i>Micronycteris megalotis</i>)			
	<i>Pteronotus davyi</i>	Cueva Mina América, Tlaquiltenango	Mesentery	Juárez, 2015
	<i>Glossophaga soricina</i>	Cueva Mina América, Tlaquiltenango	Mesentery	Peralta, 2012
	<i>Glossophaga soricina</i>	Estación Biológica El Limón, Tepalcingo	Mesentery	Peralta, 2012
	<i>Glossophaga soricina</i>	Cueva El Salitre, Xochitepec	Mesentery	Peralta, 2012
Superfamily RICTULARIOIDEA				
Rictulariidae				
<i>Pterygodermatites</i>				
(<i>Pterygodermatites</i>) <i>mexicana</i>				
	<i>Balantiopteryx plicata</i>	Cueva La Presa, Quilamula, Tlaquiltenango	Intestine	Caspeta-Mandujano et al., 2013
	<i>Balantiopteryx plicata</i>	Cueva La Presa, Quilamula, Tlaquiltenango	Intestine	Tapia, 2011
	<i>Balantiopteryx plicata</i>	Mina América, Tlaquiltenango	Intestine	Peralta, 2012
	<i>Balantiopteryx plicata</i>	Estación Biológica El Limón, Tepalcingo	Intestine	Peralta, 2012
	<i>Balantiopteryx plicata</i>	Municipio de Tlaltizapán	Intestine	Peralta, 2012
	<i>Balantiopteryx plicata</i>	Cueva La Presa, Quilamula, Tlaquiltenango	Intestine	Peralta, 2012
	<i>Balantiopteryx plicata</i>	Cueva Mina América, Tlaquiltenango	Intestine	Ojeda, 2013

Table 1. (continued) Records of helminth species from bats in Central Mexico from 2008 to 2015

Helminth	Host(s)	Locality in the State of Morelos	Site of Infection	References
Acuariidae gen. sp. (as a larva)	<i>Tadarida brasiliensis</i>	Campus UAEM, Chamilpa	Stomach	Martínez, 2009
	<i>Tadarida brasiliensis</i>	Campus UAEM, Chamilpa	Stomach	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva El Salitre, Xochitepec	Intestine	Peralta, 2009
	<i>Balantiopteryx plicata</i>	Mina América, Tlaquiltenango	Intestine	Peralta, 2012
	<i>Balantiopteryx plicata</i>	Estación Biológica El Limón, Tepalcingo	Intestine	Peralta, 2012
	<i>Balantiopteryx plicata</i>	Municipio de Tlaltizapán	Intestine	Peralta, 2012
	<i>Balantiopteryx plicata</i>	Cueva La Presa, Quilamula, Tlaquiltenango	Intestine	Peralta, 2012
	<i>Balantiopteryx plicata</i>	Cueva Mina América, Tlaquiltenango	Intestine	Ojeda, 2013
	<i>Mormoops megalophylla</i>	Cueva Mina América, Tlaquiltenango	Intestine	Ramírez, 2015
	<i>Mormoops megalophylla</i>	Cueva Mina América, Tlaquiltenango	Stomach	Peralta, 2012
	<i>Mormoops megalophylla</i>	Cueva El Clarín, Huautila	Stomach	Peralta, 2012
	<i>Mormoops megalophylla</i>	Cueva El Salitre, Xochitepec	Stomach	Peralta, 2012
	<i>Myotis velifer</i>	Cueva El Salitre, Xochitepec	Intestine	Ramírez, 2015
	<i>Pteronotus parnellii</i>	Estación Biológica El Limón, Tepalcingo	Intestine	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva Mina América, Tlaquiltenango	Intestine	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva El Salitre, Xochitepec	Intestine	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva La Presa, Quilamula, Tlaquiltenango	Intestine	Peralta, 2012
Nematoda gen. sp. (as a larva)	<i>Balantiopteryx plicata</i>	Mina América, Tlaquiltenango	Liver	Ojeda, 2013
	<i>Mormoops megalophylla</i>	Mina América, Tlaquiltenango	Intestine	Ramírez, 2015
	<i>Tadarida brasiliensis</i>	Campus UAEM, Chamilpa	Intestine	Martínez, 2009
	<i>Pteronotus parnellii</i>	Cueva El Salitre, Xochitepec	Liver	Peralta, 2009
	<i>Pteronotus parnellii</i>	Estación Biológica El Limón, Tepalcingo	Liver	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva Mina América, Tlaquiltenango	Liver	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva El Salitre, Xochitepec	Liver	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva La Presa, Quilamula, Tlaquiltenango	Liver	Peralta, 2012
	<i>Pteronotus parnellii</i>	Cueva Mina América, Tlaquiltenango	Liver	Peralta, 2012
	<i>Pteronotus davyi</i>	Cueva Mina América, Tlaquiltenango	Liver	Peralta, 2012
	<i>Dermanura azteca</i>	Campus UAEM, Chamilpa	Liver	Peralta, 2012
	<i>Leptonycteris yerbabuenae</i>	Cueva Mina América, Tlaquiltenango	Liver	Peralta, 2012
	<i>Leptonycteris yerbabuenae</i>	Cueva El Salitre, Xochitepec	Liver	Peralta, 2012
	<i>Leptonycteris yerbabuenae</i>	Estación Biológica El Limón, Tepalcingo	Liver	Peralta, 2012
	<i>Balantiopteryx plicata</i>	Mina América, Tlaquiltenango	Mesentery	Peralta, 2012
	<i>Balantiopteryx plicata</i>	Estación Biológica El Limón, Tepalcingo	Mesentery	Peralta, 2012
	<i>Balantiopteryx plicata</i>	Municipio de Tlaltizapán	Mesentery	Peralta, 2012
	<i>Balantiopteryx plicata</i>	Cueva La Presa, Quilamula, Tlaquiltenango	Mesentery	Peralta, 2012

Voucher specimens of each helminth species were deposited in the Colección Nacional de Helmintos (CNHE), Instituto de Biología, Universidad Nacional Autónoma de México. Names for all bat species have been standardized using current nomenclature (Wilson and Reeder, 2005; Ceballos and Arroyo-Cabral, 2012). However, information available in some published accounts did not allow this because in some cases there was no voucher specimen for the host and/or several congeneric species occur in sympatry, which makes identification impossible based on nonstandard common names. The taxonomy of helminths follows the criteria used in previous checklists of Neotropical bats (Santos and Gibson, 2015).

Results

Composition of the helminthological record

The helminthological record in bats in Mexico includes 59% of taxa included in Nematoda and 41% of Platyhelminthes. The majority of the species assigned to Platyhelminthes (85%) belongs to the class Trematoda, whereas the remaining 15% belongs to Cestoda (Table 1).

Helminth – bat records

Table 2 offers a reconstruction of the host spectrum of each species of helminth. It is worth noting that several of the species of bats are known exclusively from one host and one locality, usually reported in their original description. This is the case for *Rictularia nana* Caballero, 1943; *Bidigiticauda vivipara* Chitwood, 1938; *Pterygodermatites mexicana* Caspeta-Mandujano et al., 2013; and *Tricholeiperia pearsei* Chitwood, 1938.

Helminths recorded per species of bat

The information presented in Table 3 acts as a helminthological record per each species of bat. From the 27 species of bats included, *M. megalophylla* shows the greatest number of records (23 taxa). The helminthological record for *Trachops cirrhosus*, *Lasiurus cinereus*, and *L. blossevillii* in Mexico includes a single species. In Table 4 we present those records that could not be confirmed given the lack of voucher specimens or a precise identification of the species of bat. Finally, in Table 5 we present a relationship of the bat-helminth association.

Discussion

The helminthological record for bats in Mexico includes 49 taxa, 68 including available records for Central America. This number is relatively low given a high expectation of species diversity resulting from the high diversity and abundance of bats in this megadiverse region. This apparent low diversity may be an artifact of sampling, since several of the species of parasites are known from a single

record (Chandler, 1938; Chitwood, 1938; Stunakrd, 1938). In Mexico and Central America, there are very few studies that include a comprehensive survey of the helminthological fauna in a diverse group of bats, following a geographical or taxonomical approach (Ubelaker et al., 1979; Vaucher and Durette-Desset, 1986; Guzmán-Cornejo et al., 2003; Clarke, 2008). The value of surveys examining several species of bats in a single locality is threefold in that it increases the chances in detecting rare species of parasites, allows identifying patterns of host specificity (see Table 5), and facilitates the determination of a range of distribution for each species of parasite. The latter is an important aspect because species of parasites may feature a more restricted geographic distribution than their hosts.

Finally, our results highlight the relevance of methodic localized-intensive surveys to both characterize the host range of metazoan parasites and increase the chance of detecting rare or uncommon species. This information is crucial to assess the actual biodiversity of a region. With an area of 4,950 km², Morelos is slightly larger than the state of Rhode Island (3,672 km²), yet the results of our parasitological examinations resulted in 34 species of helminths (Table 1). This number represents 58% of the species of helminths recorded in Mexico. In addition, the diversity of helminths in Morelos includes 4 species that were described by our team (Peralta-Rodríguez et al., 2012; Caspeta-Mandujano et al., 2013, 2015; Jiménez et al., 2014), which represents 8% of the diversity of helminths reported in chiropterans in Mexico. In comparison, the total number of bat species surveyed for helminths in Mexico includes 19 species, which roughly represents 14% of the total diversity of chiropterans present in this country. Using a simple linear relationship, one may expect that the helminthological examination of the remaining 121 species of bats will result in the description of at least 25 new species, yet this number must be greater assuming that there are species of bats which have never been surveyed for parasites, including members of the families Noctilionidae and Thyropteridae, which have very specialized diets and morphology.

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Table 2. Records of helminth species from bats in Mexico and Central America, their host(s), geographical records, site of infection, and bibliographic references
BR = Brazil, CO = Colombia, CR = Costa Rica, MX = Mexico, NI = Nicaragua, PA = Panama, VE = Venezuela

Helminth	Host(s)	State/Province, Country	Site of Infection	References
Phylum PLATYHELMINTHES				
Class TREMATODA				
Anchitremitidae				
<i>Anchitrema sanguineum</i>	<i>Myotis velifer</i>	Morelos, MX	Intestine	Ramírez, 2015
Anenterotrematidae				
<i>Anenterotrema auritum</i>	<i>Micronycteris microtis</i> (as <i>M. megalotis mexicana</i>) <i>Natalus mexicanus</i> <i>Leptonycteris yerbabuena</i> <i>Mormoops megalophylla</i> <i>Pteronotus parnellii</i> <i>Pteronotus personatus</i> <i>Mormoops megalophylla</i> <i>Phyllostomus hastatus</i> <i>Micronycteris hirsuta</i>	Yucatán, MX Yucatán, MX Morelos, MX Morelos, MX Hidalgo, MX Veracruz, MX Veracruz, MX Chilibrillo, PN Alajuela, CR	Intestine Intestine Intestine Intestine Intestine Intestine Intestine Intestine Intestine	Stunkard, 1938; Ubelaker et al., 1979; Lunasaki and Drago, 2011 Stunkard, 1938; García-Prieto et al., 2012 Juárez, in process Ramírez, 2015 Caballero y Zerecero, 1942; García et al., 2012 Clarke, 2008 Clarke, 2008 Caballero and Grocott, 1960; Lamothe-Argumedo et al., 1997 Caballero, 1964
Dicrocoeliidae				
<i>Dicrocoelium rileyi</i>	<i>Tadarida brasiliensis</i> <i>Tadarida brasiliensis</i> <i>Tadarida brasiliensis</i> <i>Tadarida brasiliensis</i>	Morelos, MX Durango, MX Puebla, MX Nuevo León, MX	Gallbladder Gallbladder Gallbladder Gallbladder	Martínez, 2009; Peralta, 2012 Guzmán-Cornejo et al., 2003; García-Prieto et al., 2012 Guzmán-Cornejo et al., 2003; Caballero and Caballero, 1969 Guzmán-Cornejo et al., 2003; Díaz-Moreno, 1977; Caballero y Caballero & Caballero-Rodríguez, 1969; García-Prieto et al., 2012 Guzmán-Cornejo et al., 2003; García-Prieto et al., 2012 Caballero y Caballero & Caballero-Rodríguez, 1969
<i>Platynosom beltrani</i>	<i>Tadarida brasiliensis</i> <i>Tadarida brasiliensis</i>	Zacatecas, MX Nuevo León, MX	Gallbladder Intestine	
Lecithodendriidae				
<i>Castroia silvai</i>	<i>Micronycteris hirsuta</i>	Alajuela, CR	Intestine	Caballero and Montero-Gei, 1963; Lamothe-Argumedo et al., 1997; Rodríguez-Ortiz et al., 2004
<i>Ochoterotrematidae labda</i>				
	<i>Mormoops megalophylla</i> <i>Mormoops megalophylla</i> <i>Pteronotus davyi</i> <i>Natalus stramineus</i> <i>Balaniopteryx plicata</i> <i>Myotis velifer</i> <i>Natalus mexicanus</i>	Morelos, MX Veracruz, MX Veracruz, MX Mexico City, MX Morelos, MX Morelos, MX Mexico City, MX; Estado de México, MX	Intestine, stomach Intestine Intestine Intestine Intestine Intestine Intestine	Peralta, 2012; Ramírez, 2015 Clarke, 2008 Clarke, 2008 Caballero y Caballero, 1943a Ojeda, 2013; Tapia, 2011; Peralta, 2012 Ramírez, 2015; Peralta, 2012 Lamothe-Argumedo et al., 1997
	<i>Tadarida brasiliensis</i> <i>Tadarida brasiliensis</i> <i>Tadarida brasiliensis</i> <i>Tadarida brasiliensis</i>	Morelos, MX Mexico City, MX Durango, MX Estado de México, MX Nuevo León, MX	Intestine Intestine Intestine Intestine	Martínez, 2009; Peralta, 2012 Caballero y Caballero 1943a; García-Prieto et al., 2012 Guzmán-Cornejo et al., 2003; García-Prieto et al., 2012 Caballero y Caballero, 1943a; García-Prieto et al., 2012 Guzmán-Cornejo et al., 2003; Díaz-Moreno, 1977; García-Prieto et al., 2012
	<i>Tadarida brasiliensis</i> <i>Tadarida brasiliensis</i>	Puebla, MX Zacatecas, MX	Intestine Intestine	Guzmán-Cornejo et al., 2003; García-Prieto et al., 2012 Guzmán-Cornejo et al., 2003; García-Prieto et al., 2012

Table 2 (continued). Records of helminth species from bats in Mexico and Central America,

Helminth	Host(s)	State/Province, Country	Site of Infection	References
<i>Paralecithodendrium emodillum</i>	<i>Natalus mexicanus</i>	Mexico City, MX	Intestine	Caballero and Caballero, 1943a; Pérez-Ponce et al., 1996; Lamothe-Argumedo et al., 1997; García-Prieto et al., 2012
<i>Paralecithodendrium macnabi</i>	<i>Lasiurus cinereus</i>	Mexico City, MX	Intestine	Caballero and Caballero y Zerecero, 1951; Lamothe-Argumedo et al., 1997; García-Prieto et al., 2012
<i>Paralecithodendrium scabrum</i>	<i>Lasiurus cinereus</i> <i>Myotis velifer</i>	Mexico City, MX Morelos, MX	Intestine Intestine	Caballero, 1943b; Caballero and Zerecero, 1951 Peralta, 2012
<i>Prosthodendrium cordiforme</i>	<i>Mormoops megalophylla</i>	Morelos, MX	Intestine	Ramírez, 2015
	<i>Eptesicus propinquus</i>	Finca Monte de Heredia, CR	Intestine	Caballero and Brenes-Madrigal, 1957; Lamothe-Argumedo et al., 1997; Rodríguez-Ortiz et al., 2004
Phaneropsolidae				
<i>Limatulum aberrans</i>	<i>Macrotus waterhousii</i> (as <i>Macrotus mexicanus mexicanus</i>)	Oaxaca, MX	Intestine	Caballero and Bravo, 1950; Ubelaker et al., 1979; Pérez-Ponce de León et al., 1996; Lamothe-Argumedo et al., 1997; García-Prieto et al., 2012
<i>Limatulum costarricensis</i>	<i>Eptesicus propinquus</i>	Finca Monte de Heredia, CR	Intestine	Caballero and Brenes-Madrigal, 1957; Lamothe-Argumedo et al., 1997; Rodríguez-Ortiz et al., 2004
<i>Limatulum diminutum</i>	<i>Pteronotus parnellii</i>	Morelos, MX	Stomach	Peralta, 2009, 2012
<i>Limatulum gastroides</i>	<i>Pteronotus davyi</i>	Morelos, MX	Stomach	Peralta, 2012; Juárez, 2015
	<i>Pteronotus personatus</i>	Morelos, MX	Stomach	Peralta, 2012
	<i>Mormoops megalophylla</i>	Morelos, MX	Stomach	Ramírez, 2015
	<i>Pteronotus parnellii</i>	Morelos, MX	Stomach	Peralta, 2012
	<i>Pteronotus parnellii</i>	Jalisco, MX	Intestine	García-Vargas et al., 1996; Pérez-Ponce de León et al., 1996; García-Prieto et al., 2012
<i>Limatulum ishmicus</i> <i>Limatulum limatulum</i>	<i>Balantiopteryx plicata</i>	Morelos, MX	Stomach	Ojeda, 2013; Peralta, 2012
	<i>Mormoops megalophylla</i>	Morelos, MX	Stomach	Peralta, 2012
	<i>Pteronotus davyi</i>	Morelos, MX	Stomach	Peralta, 2012; Juárez, 2015
	<i>Micronycteris hirsuta</i>	Heredia, CR	Intestine	Caballero, 1964
	<i>Natalus mexicanus</i>	Hidalgo, MX	Intestine	Caballero, 1943b
<i>Limatulum oklahomense</i>	<i>Tadarida brasiliensis</i>	Oaxaca, MX	Intestine	Caballero and Bravo, 1950
	<i>Pteronotus parnellii</i>	Morelos, MX	Stomach	Martínez, 2009
	<i>Myotis velifer</i>	Morelos, MX	Stomach	Peralta, 2009, 2012
	<i>Pteronotus davyi</i>	Morelos, MX	Stomach	Ramírez, 2015; Peralta, 2012
	<i>Mormoops megalophylla</i>	Morelos, MX	Stomach	Juárez, 2015
	<i>Pteronotus parnellii</i>	Morelos, MX	Stomach	Ramírez, 2015
	<i>Natalus mexicanus</i>	Morelos, MX	Stomach	Peralta, 2009, 2012
		Hidalgo, MX	Stomach	Caballero, 1943a; Caballero and Bravo, 1950; Lamothe-Argumedo et al., 1997
<i>Maxbraunium tubiporum</i>	<i>Natalus stramineus</i>	Morelos, MX	Stomach	Peralta, 2012
	<i>Pteronotus davyi</i>	Morelos, MX	Stomach	Juárez, 2015
	<i>Mormoops megalophylla</i>	Morelos, MX	Stomach	Ramírez, 2015
	<i>Myotis nigricans</i>	Panama, PN	Intestine	Ubelaker et al., 1979
	<i>Micronycteris hirsuta</i>	Heredia, CR	Intestine	Caballero, 1964
	<i>Mormoops megalophylla</i>	Veracruz, MX	Intestine	Clarke, 2008
	<i>Pteronotus personatus</i>	Veracruz, MX	Intestine	Clarke, 2008
	<i>Pteronotus parnellii</i>	Hidalgo, MX	Intestine	Caballero and Zerecero, 1942; Pérez-Ponce et al., 1996; García-Prieto et al., 2012

Table 2 (continued). Records of helminth species from bats in Mexico and Central America,

Helminth	Host(s)	State/Province, Country	Site of Infection	References
<i>Parabascus yucatanensis</i>	<i>Natalus mexicanus</i>	Yucatán, MX	Intestine	Stunkard, 1938; García-Prieto et al., 2012
	<i>Natalus mexicanus</i>	Morelos, MX	Intestine	Peralta, 2012
	<i>Mormoops megalophylla</i>	Morelos, MX	Intestine	Peralta, 2012; Ramírez, 2015
<i>Tremajoannes buckleyi</i>	<i>Myotis velifer</i>	Morelos, MX	Intestine	Ramírez, 2015
Plagiatorchiidae				
<i>Plagiatorchis micracanthos</i>	<i>Pipistrellus hesperus</i>	Sinaloa, MX	Intestine	Heddergott y Steinbach, 2015
<i>Plagiatorchis muris</i>	<i>Natalus mexicanus</i>	Mexico City, MX	Intestine	Caballero, 1943; Pérez-Ponce et al., 1996; Lamothe-Argumedo et al., 1997; García-Prieto et al., 2012
				Caballero, 1943
	<i>Natalus mexicanus</i>	Estado de México, MX	Intestine	Peralta, 2009, 2012
	<i>Pteronotus parnellii</i>	Morelos, MX	Intestine	Caballero, 1940, 1943a; Lamothe-Argumedo et al., 1997;
<i>Plagiatorchis vespertilionis</i>	<i>Tadarida brasiliensis</i>	Mexico City, MX	Intestine	García-Prieto et al., 2012
	<i>Myotis velifer</i>	Morelos, MX	Intestine	Peralta, 2012
Urotrematidae				
<i>Urotrema scabridum</i>	<i>Tadarida brasiliensis</i>	Morelos, MX	Intestine	Martínez, 2009; Peralta, 2012
	<i>Pteronotus parnellii</i>	Morelos, MX	Intestine	Peralta, 2009, 2012
	<i>Pteronotus parnellii</i>	Morelos, MX	Intestine	Peralta, 2009, 2012
	<i>Balantiopteryx plicata</i>	Morelos, MX	Intestine	Ojeda, 2013; Peralta, 2012
	<i>Pteronotus davyi</i>	Morelos, MX	Intestine	Juárez, 2015; Peralta, 2012
	<i>Pteronotus personatus</i>	Morelos, MX	Intestine	Peralta, 2012
	<i>Myotis velifer</i>	Morelos, MX	Intestine	Ramírez, 2015
	<i>Mormoops megalophylla</i>	Morelos, MX	Intestine	Ramírez, 2015
	<i>Tadarida brasiliensis</i>	Durango, MX	Intestine	Guzmán-Cornejo et al., 2003
	<i>Tadarida brasiliensis</i>	Estado de México, MX	Intestine	Caballero, 1942
	<i>Tadarida brasiliensis</i>	Nuevo León, MX	Intestine	Guzmán-Cornejo et al., 2003; Díaz-Moreno, 1977
	<i>Tadarida brasiliensis</i>	Puebla, MX	Intestine	Guzmán-Cornejo et al., 2003
	<i>Natalus mexicanus</i>	Mexico City, MX	Intestine	Caballero, 1942a; Lamothe-Argumedo et al., 1997;
				García-Prieto et al., 2012
	<i>Eptesicus propinquus</i>	Finca Monte de Heredia, CR	Intestine	Caballero et al., 1957; Lamothe-Argumedo et al., 1997;
				Rodríguez-Ortiz et al., 2004
Class CESTODA				
Hymenolepididae				
<i>Vampirolepis artibeii</i>	<i>Artibeus phaeotis</i>	Veracruz, MX	Intestine	García, 1986; Lamothe-Argumedo et al., 1997;
				García-Prieto et al., 2012
	<i>Tadarida brasiliensis</i>	Morelos, MX	Intestine	Martínez, 2009; Peralta, 2012
<i>Vampirolepis decipiens</i>	<i>Pteronotus parnellii</i>	Morelos, MX	Intestine	Peralta, 2009, 2012
	<i>Balantiopteryx plicata</i>	Morelos, MX	Intestine	Tapia, 2011; Peralta, 2012; Ojeda, 2013
	<i>Mormoops megalophylla</i>	Morelos, MX	Intestine	Peralta, 2012; Ramírez, 2015
	<i>Natalus mexicanus</i>	Morelos, MX	Intestine	Peralta, 2012
	<i>Myotis velifer</i>	Morelos, MX	Intestine	Peralta, 2012; Ramírez, 2015
	<i>Pteronotus davyi</i>	Jalisco, MX	Intestine	Peralta, 2012; Ramírez, 2015
	<i>Artibeus jamaicensis</i>	Jalisco, MX	Intestine	García-Vargas et al., 1996
<i>Vampirolepis elongatus</i>	<i>Pteronotus davyi</i>	Veracruz, MX	Intestine	García-Vargas et al., 1996
	<i>Mormoops megalophylla</i>	Veracruz, MX	Intestine	Clarke, 2008

Table 2 (continued). Records of helminth species from bats in Mexico and Central America,

Helminth	Host(s)	State/Province, Country	Site of Infection	References
<i>Vampirolepis gertschi</i>	<i>Balantiopteryx plicata</i>	Morelos, MX	Intestine	Tapia, 2011; Peralta, 2012
	<i>Dermanura azteca</i>	Morelos, MX	Intestine	Peralta, 2012
	<i>Leptonycteris verbabueneae</i>	Morelos, MX	Intestine	Juárez, in process; Peralta, 2012
	<i>Mormoops megalophylla</i>	Morelos, MX	Intestine	Ramírez, 2015
	<i>Glossophaga soricina</i>	Morelos, MX	Intestine	Peralta, 2012
	<i>Glossophaga soricina</i>	Nicaragua, NI	Intestine	Ubelaker et al., 1979
	<i>Artibeus jamaicensis</i>	Veracruz, MX	Intestine	García, 1995; Lamothe-Argumedo et al., 1997; García-Prieto et al., 2012
	<i>Molossus ater</i>	Río de Janeiro, BR	Intestine	Ubelaker et al., 1979
	<i>Macrotus waterhousii</i>	Morelos, MX	Intestine	Peralta, 2012; Galindo, 2014
	<i>Mormoops megalophylla</i>	Morelos, MX	Intestine	Ramírez, 2015
Phylum NEMATODA Superfamily TRICHOSTRONGYLOIDEA Ornithostromyidae <i>Allintoshius tadaridae</i>	<i>Myotis velifer</i>	Morelos, MX	Intestine	Ramírez, 2015; Peralta, 2012
	<i>Mormoops megalophylla</i>	Morelos, MX	Intestine	Ramírez, 2015
	<i>Tadarida brasiliensis</i>	Mexico City, MX	Intestine	Caballero, 1942
	<i>Tadarida brasiliensis</i>	Estado de México, MX	Intestine	Caballero, 1942
	<i>Natalus mexicanus</i>	Estado de México, MX	Intestine	Caballero, 1942
	<i>Natalus mexicanus</i>	Mexico City, MX	Intestine	Caballero, 1942; Lamothe-Argumedo et al., 1997; García-Prieto et al., 2012
Molineidae <i>Biacantha desmoda</i>	<i>Desmodus rotundus</i>	Jalisco, MX	Intestine	García et al., 1996; Pérez-Ponce et al., 1996; García-Prieto et al., 2012
<i>Bigiticauda vivipara</i>	<i>Artibeus jamaicensis</i>	Guerrero, MX	Intestine	García et al., 1996; Pérez-Ponce et al., 1996; Lamothe-Argumedo et al., 1997; García-Prieto et al., 2012
<i>Cheiropteronema globocephala</i>	<i>Artibeus lituratus</i>	La Pacífica, CR	Intestine	Ubelaker et al., 1979
	<i>Artibeus lituratus</i>	Sabana Grande, NI	Intestine	Ubelaker et al., 1979
	<i>Artibeus jamaicensis</i>	Guerrero, MX	Intestine	Caballero-DeLOYA, 1971; Chitwood, 1938
		Chiapas, MX	Intestine	Ubelaker et al., 1979
		Yucatán, MX	Intestine	Chitwood, 1938; Sandground, 1929; Ubelaker et al., 1979; García-Prieto et al., 2012
<i>Artibeus phaeotis</i>	<i>Artibeus lituratus</i>	Osa Peninsula, CR	Intestine	Ubelaker et al., 1979
		Chiapas, MX	Intestine	Ubelaker et al., 1979
		Sabana Grande, NI	Intestine	Ubelaker et al., 1979
		Osa Peninsula, CR	Intestine	Ubelaker et al., 1979
		Chiapas, MX	Intestine	Ubelaker et al., 1979
		San Antonio, NI	Intestine	Ubelaker et al., 1979

Table 2 (continued). Records of helminth species from bats in Mexico and Central America,

Helminth	Host(s)	State/Province, Country	Site of Infection	References
<i>Histiostrongylus coronatus</i>	<i>Artibeus toltecus</i>	Chiapas, MX	Intestine	Ubelaker et al., 1979
	<i>Carollia perspicillata</i>	Osa Peninsula, CR	Intestine	Ubelaker et al., 1979
	<i>Carollia perspicillata</i>	E Moyogalpa, NI	Intestine	Ubelaker et al., 1979
	<i>Phyllostomus discolor</i>	Chiapas, MX	Intestine	Ubelaker et al., 1979
<i>Histiostrongylus spinosus</i> <i>Linstrongylus pteronoti</i>	<i>Phyllostomus hastatus</i>	Mato Grosso, BR	Intestine	Ubelaker et al., 1979
	<i>Phyllostomus discolor</i>	Sabana Grande, NI	Intestine	Ubelaker et al., 1979
	<i>Glossophaga soricina</i>	Sabana Grande, NI	Intestine	Ubelaker et al., 1979
		Nicaragua	Intestine	Vaucher and Durette-Desset, 1999
<i>Macuahuitlodes inexpectans</i> <i>Parahistiostrongylus octacanthus</i>		Jalisco, MX	Intestine	García, 1995; Pérez-Ponce et al., 1996; Lamothe-Argumedo et al., 1997; García-Prieto et al., 2012
		Veracruz, MX	Intestine	Clarke, 2008
		Morelos, MX	Intestine	Juárez, 2015
		Nicaragua	Intestine	Vaucher and Durette-Desset, 1986
<i>Tadaridanema delicatus</i>	<i>Mormoops megalophylla</i>	Morelos, MX	Intestine	Jiménez et al., 2014; Ramírez, 2015
	<i>Artibeus jamaicensis</i>	Nicaragua	Intestine	Ubelaker et al., 1979
	<i>Phyllostomus hastatus</i>	Nicaragua	Intestine	Ubelaker et al., 1979
	<i>Tadarida brasiliensis</i>	Nuevo León, MX	Intestine	Falcón-Ordaz, et al., 2006; Guzmán-Cornejo et al., 2003; García-Prieto et al., 2012
<i>Tadarida brasiliensis</i>		Durango, MX	Intestine	Falcón-Ordaz, et al., 2006; Guzmán-Cornejo et al., 2003;
		Zacatecas, MX	Intestine	García-Prieto et al., 2012
		Sinaloa, MX	Intestine	Falcón-Ordaz, et al., 2006; Guzmán-Cornejo et al., 2003;
		Puebla, MX	Intestine	García-Prieto et al., 2012
<i>Torrestrongylus tetradorsalis</i> <i>Tricholeiperia carneiensis</i>	<i>Macrotus waterhousii</i>	Morelos, MX	Intestine	Cain y Studier, 1974
	<i>Natalus mexicanus</i>	Morelos, MX	Intestine	Falcón-Ordaz, et al., 2006; Guzmán-Cornejo et al., 2003;
		Yucatán, MX	Intestine	García-Prieto et al., 2012
		Morelos	Intestine	García-Prieto et al., 2012
<i>Tricholeiperia leiperi</i> <i>Tricholeiperia pearsei</i>	<i>Mormoops megalophylla</i>	Morelos, MX	Intestine	Martínez, 2009; Peralta, 2012
	<i>Trachops cirrhosus</i>	Chiapas, MX	Intestine	Caspeta-Mandujano et al., 2015; Peralta, 2012
		Yucatán, MX	Lung	Chitwood, 1938; Pérez-Ponce et al., 1996; Lamothe-Argumedo et al., 1997; García-Prieto et al., 2012
		Jalisco, MX	Intestine	Peralta, 2012
<i>Websternema parnelli</i>	<i>Pteronotus parnelli</i>	Morelos, MX	Intestine	Peralta, 2012; Ramírez, 2015
		Chiapas, MX	Intestine	Caballero, 1951; Ubelaker et al., 1979; Pérez-Ponce et al., 1996;
		Yucatán, MX	Intestine	Lamothe-Argumedo et al., 1997; García-Prieto et al., 2012
		Jalisco, MX	Intestine	Chitwood, 1938; Pérez-Ponce et al., 1996;
Superfamily TRICHIINELLOIDEA Capillariidae <i>Aonchotheca martinezi</i>	<i>Natalus mexicanus</i> (as <i>Natalus stramineus</i>)	Mexico City, MX	Stomach	García-Prieto et al., 2012
	<i>Natalus mexicanus</i>	Morelos, MX	Intestine	García, 1995; Pérez-Ponce et al., 1996;
	<i>Glossophaga soricina</i>	Morelos, MX	Intestine	Lamothe-Argumedo et al., 1997; García-Prieto et al., 2012
	<i>Leptonycteris yerbabuenae</i>	Morelos, MX	Intestine	Vaucher and Durette-Desset, 1986
<i>Aonchotheca speciosa</i>				Peralta, 2009, 2012

Table 2 (continued). Records of helminth species from bats in Mexico and Central America,

Helminth	Host(s)	State/Province, Country	Site of Infection	References
<i>Capillaria palmata</i> <i>Capillaria</i> sp.	<i>Macrotus waterhousii</i>	Morelos, MX	Intestine	Peralta, 2012
	<i>Dermanura azteca</i>	Morelos, MX	Intestine	Peralta, 2012
	<i>Myotis velifer</i>	Morelos, MX	Intestine	Peralta, 2012
	<i>Mormoops megalophylla</i>	Morelos, MX	Intestine	Peralta, 2012
	<i>Dermanura azteca</i>	Morelos, MX	Intestine	Peralta, 2012
	<i>Tadarida brasiliensis</i>	Morelos, MX	Intestine	Peralta, 2012
	<i>Tadarida brasiliensis</i>	Morelos, MX	Intestine	Martínez, 2009
	<i>Desmodus rotundus</i>	Yucatán, MX	Intestine, stomach	Lamothe-Argumedo et al., 1997; Rojas and Guerrero, 2007
	<i>Microonycteris microtis</i>	Yucatán, MX	Intestine	Chitwood, 1938
	<i>Pteronotus davyi</i>	<i>Pteronotus personatus</i>	Intestine	Intestine Clarke, 2008
<i>Pterothomomys</i> sp.	<i>Desmodus rotundus</i>	Morelos, MX	Intestine	Peralta, 2012
	<i>Pteronotus parnellii</i>	Jalisco, MX	Intestine	García, 1996; Lamothe-Argumedo et al., 1997; García-Prieto et al., 2012
<i>Trichuroides myoti</i>	<i>Pteronotus davyi</i>	Morelos, MX	Intestine	Peralta, 2012
	<i>Pteronotus davyi</i>	Morelos, MX	Intestine	Juárez, 2015
	<i>Pteronotus parnellii</i>	Morelos, MX	Intestine	Peralta, 2009, 2012
	<i>Mormoops megalophylla</i>	Morelos, MX	Intestine	Ramírez, 2015
	<i>Balantiopteryx plicata</i>	Morelos, MX	Stomach	Peralta, 2012
	<i>Myotis velifer</i>	Morelos, MX	Stomach	Ramírez, 2015
Superfamily FILARIOIDEA				
Onchocercidae				
<i>Litomosoides brasiliensis</i>	<i>Artibeus toltecus</i>	Veracruz, MX	Mesentery	Lamothe-Argumedo et al., 1993; Pérez-Ponce de León et al., 1996; García-Prieto et al., 2012; Bain et al., 2003
<i>Litomosoides chitwoodi</i> <i>Litomosoides fosteri</i>	<i>Carollia perspicillata</i>	Costa Rica	Mesentery	Caballero, 1944; Jiménez-Quiroz & Arrollo, 1960
	<i>Artibeus jamaicensis</i>	Panama	Mesentery	Caballero & Caballero, 1944; Ubelaker et al., 1979
	<i>Glossophaga soricina</i>	Yucatán, MX	Mesentery	Bain et al., 2003; García-Prieto et al., 2012
	<i>Glossophaga soricina</i>	Panama	Mesentery	Caballero, 1947; Ubelaker et al., 1979; Lamothe-Argumedo et al., 1997
<i>Litomosoides guiterasi</i>	<i>Pteronotus parnellii</i>	Chiapas, MX	Mesentery	Ubelaker et al., 1979
	<i>Pteronotus parnellii</i>	Morelos, MX	Mesentery	Peralta, 2009, 2012
	<i>Glossophaga soricina</i>	Morelos, MX	Mesentery	Peralta, 2012
	<i>Leptonycteris yerbabuenae</i>	Morelos, MX	Mesentery	Peralta, 2012
<i>Litomosoides</i> sp. (as a larva)	<i>Macrotus waterhousii</i>	Morelos, MX	Mesentery	Galindo, 2014
	<i>Mormoops megalophylla</i>	Morelos, MX	Mesentery	Ramírez, 2015
	<i>Pteronotus parnellii</i>	Morelos, MX	Mesentery	Peralta, 2012
	<i>Leptonycteris yerbabuenae</i>	Morelos, MX	Intestine	Peralta, 2012
<i>Litomosoides hamletti</i>	<i>Glossophaga soricina</i>	Yucatán, MX	Mesentery	Chitwood, 1938; Pérez-Ponce de León et al., 1996; García-Prieto et al., 2012
<i>Litomosoides leonilavazquezae</i>	<i>Macrotus waterhousii</i>	Guerrero, MX	Mesentery	Caballero, 1939; Ubelaker et al., 1979; Pérez-Ponce de León et al., 1996;
	<i>mexicanus</i> (as <i>M. mexicanus</i>)			Lamothe-Argumedo et al., 1997; García-Prieto et al., 2012
<i>Litomosoides penai</i> <i>Litomosoides</i> sp. (microfilariae)	<i>Carollia perspicillata</i>	Costa Rica	Mesentery	Jiménez-Quirós and Arroyo-Sancho, 1960
	<i>Artibeus jamaicensis</i>	Panama	Blood	Bain et al., 2002
		Costa Rica	Blood	Cottontail et al., 2009

Table 2 (continued). Records of helminth species from bats in Mexico and Central America,

Helminth	Host(s)	State/Province, Country	Site of Infection	References
Superfamily PHYSALOPTEROIDEA				
Physalopteridae				
<i>Physaloptera</i> sp. (as a larva)	<i>Mormoops megalophylla</i>	Morelos, MX	Mesentery	Ramírez, 2015
Spiruridae				
<i>Spirura mexicana</i>	<i>Pteronotus parnellii</i> <i>P. personatus</i> <i>P. davyi</i> <i>Mormoops megalophylla</i> <i>Macrotus waterhousii</i>	Morelos, MX Morelos, MX Morelos, MX Morelos, MX Morelos, MX	Esophagus Esophagus Esophagus Esophagus Esophagus	Peralta, 2009; Peralta et al., 2012 Peralta, 2012 Peralta, 2012; Juárez, 2015 Ramírez, 2015 Galindo, 2014; Peralta, 2012
Spiroceridae				
<i>Physocephalus sexalatus</i> (as a larva)	<i>Pteronotus parnellii</i> <i>Balantiopteryx plicata</i> <i>Micronycteris microtis</i> (as <i>M. megalotis</i>) <i>Pteronotus davyi</i> <i>Glossophaga soricina</i>	Morelos, MX Morelos, MX Morelos, MX Morelos, MX Morelos, MX	Mesentery Mesentery Mesentery Mesentery Mesentery	Peralta, 2009, 2012 Tapia, 2011; Peralta, 2012; Ojeda, 2013 Peralta, 2012 Juárez, 2015 Peralta, 2012
Superfamily RICTULARIOIDEA				
Rictulariidae				
<i>Pterygodermatites</i> (<i>Pterygodermatites</i>) <i>mexicana</i> <i>Rictularia nana</i>	<i>Balantiopteryx plicata</i> <i>Balantiopteryx plicata</i>	Morelos, MX Puebla, MX	Intestine Intestine	Caspeta-Mandujano et al., 2013; Tapia, 2011; Peralta, 2012; Ojeda, 2013 Caballero, 1943c; García-Prieto et al., 2012; Pérez-Ponce de León et al., 1996
Seuratidae				
<i>Seuratum cancellatum</i>	<i>Natalus mexicanus</i>	Yucatán, MX	Lungs	Chitwood, 1938; García-Prieto et al., 2012; Pérez-Ponce de León et al., 1996
Acuariidae gen. sp. (as a larva)				
	<i>Tadarida brasiliensis</i> <i>Pteronotus parnellii</i> <i>Balantiopteryx plicata</i> <i>Mormoops megalophylla</i> <i>Myotis velifer</i>	Morelos, MX Morelos, MX Morelos, MX Morelos, MX Morelos, MX	Stomach Intestine Intestine Stomach, intestine Intestine	Martínez, 2009; Peralta, 2012 Peralta, 2009, 2012 Peralta, 2012; Ojeda, 2013 Peralta, 2012; Ramírez, 2015 Ramírez, 2015
Nematoda gen. sp. (as a larva)				
	<i>Balantiopteryx plicata</i> <i>Mormoops megalophylla</i> <i>Tadarida brasiliensis</i> <i>Pteronotus parnellii</i> <i>P. davyi</i> <i>D. azteca</i> <i>Leptonycteris yerbabuenae</i> <i>Balantiopteryx plicata</i>	Morelos, MX Morelos, MX Morelos, MX Morelos, MX Morelos, MX Morelos, MX Morelos, MX	Liver Intestine Intestine Liver Liver Liver Liver Liver	Ojeda, 2013 Ramírez, 2015 Martínez, 2009 Peralta, 2009, 2012 Peralta, 2012 Peralta, 2012 Peralta, 2012 Peralta, 2012

Table 3. Checklist of species of parasites recorded per bat species in Mexico and Central America

Bat Species	Helminth Species	References
Family Emballonuridae		
<i>Balantiopteryx plicata</i> Peters, 1867	<i>Ochoterenatrema labda</i>	Caballero, 1943
	<i>Limatulum gastroides</i>	García, 1995
	<i>Urotrema scabridum</i>	Caballero y Caballero 1942a
	<i>Vampirolepis decipiens</i>	Peralta, 2009
	<i>Vampirolepis elongatus</i>	García, 1995
	<i>Trichuroides myoti</i>	Peralta, 2012
	<i>Physocephalus sexalatus</i> (as a larva)	Peralta, 2012
	<i>Pterygodermatites</i> (<i>Pterygodermatites</i>) <i>mexicana</i>	Caspeta-Mandujano et al. 2013
	<i>Rictularia nana</i>	Caballero, 1943c
	Acuariidae gen. sp. (as a larva)	Peralta, 2012
	Nematoda gen. sp. (as a larva)	Peralta, 2012
Family Molossidae		
<i>Tadarida brasiliensis</i> (Geoffroy, 1824)	<i>Dicrocoelium rileyi</i>	Caballero and Caballero, 1969
	<i>Platynosum beltrani</i>	Caballero and Caballero, 1969
	<i>Ochoterenatrema labda</i>	Caballero, 1943
	<i>Limatulum limatulum</i>	Caballero, 1943b
	<i>Plagiorchis vespertilionis</i>	Caballero, 1940
	<i>Urotrema scabridum</i>	Caballero, 1942
	<i>Vampirolepis decipiens</i>	Peralta, 2012
	<i>Allintoshius tadaridae</i>	Caballero, 1942
	<i>Tadaridanema delicatus</i>	Falcon-Ordaz et al., 2006
	<i>Capillaria palmata</i>	Martínez, 2009
	Acuariidae gen. sp. (as a larva)	Martínez, 2009
	Nematoda gen. sp. (as a larva)	Martínez, 2009
Family Mormoopidae		
<i>Mormoops megalophylla</i> Peters, 1864	<i>Anenterotrema auritum</i>	Ramírez, 2015
	<i>Ochoterenatrema labda</i>	Peralta, 2012
	<i>Paralecithodendrium scabrum</i>	Ramírez, 2015
	<i>Limatulum diminutum</i>	Ramírez, 2015
	<i>Limatulum gastroides</i>	Peralta, 2012
	<i>Limatulum limatulum</i>	Ramírez, 2015
	<i>Limatulum oklahomense</i>	Ramírez, 2015
	<i>Maxbraunium tubiporum</i>	Ramírez, 2015
	<i>Parabascus yucatanensis</i>	Peralta, 2012
	<i>Urotrema scabridum</i>	Ramírez, 2015
	<i>Vampirolepis decipiens</i>	Peralta, 2012
	<i>Vampirolepis elongatus</i>	Ramírez, 2015
	<i>Vampirolepis gertschi</i>	Peralta, 2012
	<i>Allintoshius tadaridae</i>	Ramírez, 2015
	<i>Aonchoteca speciose</i> ; <i>Linustrongylus pteronoti</i>	Peralta, 2012; Ramírez, 2015
	<i>Macuahuitloides inexpectans</i>	Jiménez et al., 2013
	<i>Tricholeiperia carnegiensis</i>	Ramírez, 2015
	<i>Pterothominx</i> sp.	Ramírez, 2015
	<i>Litomosoides guiterasi</i>	Ramírez, 2015
	<i>Physaloptera</i> sp.	Ramírez, 2015
	<i>Spirura mexicana</i>	Peralta et al., 2012
	Acuariidae gen. sp. (as a larva)	Peralta, 2012
	Nematoda gen. sp. (as a larva)	Ramírez, 2015

Table 3 (continued). Checklist of species of parasites recorded per bat species in Mexico and Central America

Bat Species	Helminth Species	References
<i>Pteronotus davyi</i> Gray, 1838	<i>Ochoterenatrema labda</i>	Clarke, 2008
	<i>Limatulum diminutum</i>	Peralta, 2012
	<i>Limatulum gastroides</i>	Peralta, 2012
	<i>Limatulum limatulum</i>	García, 1995
	<i>Limatulum oklahomense</i>	Peralta, 2012
	<i>Urotrema scabridum</i>	Peralta, 2012
	<i>Vampirolepis elongatus</i>	García, 1995
	<i>Linustrongylus pteronoti</i>	García, 1995
	<i>Websternema parnelli</i>	García, 1965
	<i>Pterothominx</i> sp.	García, 1995
	<i>Litomosoides guiterasi</i> (as a larva)	Peralta, 2012
	<i>Physocephalus sexalatus</i> (as a larva); Nematoda gen. sp. (as a larva)	Juárez, 2015; Peralta, 2012
<i>Pteronotus parnelli</i> Miller, 1902	<i>Limatulum diminutum</i>	Peralta, 2009
	<i>Limatulum gastroides</i>	García, 1995
	<i>Limatulum limatulum</i>	Peralta, 2009
	<i>Limatulum oklahomense</i>	Peralta, 2009
	<i>Plagiorchis muris</i>	Peralta, 2009
	<i>Urotrema scabridum</i>	Peralta, 2009
	<i>Vampirolepis decipiens</i>	Peralta, 2009
	<i>Vampirolepis gertschi</i>	Peralta, 2012
	<i>Linustrongylus pteronoti</i>	Peralta, 2009
	<i>Websternema parnelli</i>	García, 1995
	<i>Pterothominx</i> sp.	Peralta, 2009
	<i>Litomosoides guiterasi</i>	Peralta, 2009
	<i>Litomosoides guiterasi</i> (as a larva)	Peralta, 2009
	<i>Spirura mexicana</i>	Peralta, 2009
	<i>Physocephalus sexalatus</i> (as a larva)	Peralta, 2009
	Acuariidae gen. sp. (as a larva)	Peralta, 2009
<i>Pteronotus personatus</i> (Wagner, 1843)	<i>Limatulum diminutum</i>	Peralta, 2012
	<i>Limatulum gastroides</i>	Peralta, 2012
	<i>Maxbraunium tubiporum</i>	Peralta, 2012
	<i>Urotrema scabridum</i>	Peralta, 2012
Family Natalidae		
<i>Natalus mexicanus</i> Miller, 1902	<i>Anenterotrema auritum</i>	Stunkard, 1938
	<i>Ochoterenatrema labda</i>	Lunaschi and Drago, 2011
	<i>Paralecithodendrium emodillum</i>	Caballero, 1943b
	<i>Limatulum limatulum</i>	Caballero, 1943b
	<i>Limatulum oklahomense</i>	Caballero and Bravo Hollis, 1950
	<i>Parabascus yucatanensis</i>	Stunkard, 1938
	<i>Plagiorchis muris</i>	Caballero, 1943
	<i>Urotrema scabridum</i>	Caballero, 1942
	<i>Vampirolepis decipiens</i>	Peralta, 2012
	<i>Allintoshius tadaridae</i>	Caballero, 1942
	<i>Tricholeiperia carnegiensis</i>	Chitwood, 1938
	<i>Tricholeiperia pearsei</i>	Chitwood, 1938
	<i>Aonchotheca speciosa</i>	
	<i>Seuratium cancellatum</i>	Chitwood, 1938

Table 3 (continued). Checklist of species of parasites recorded per bat species in Mexico and Central America

Bat Species	Helminth Species	References
Family Phyllostomidae		
<i>Artibeus aztecus</i> (Andersen, 1906)	<i>Vampirolepis elongatus</i> <i>Aonchotheca speciosa</i> <i>Litosomoides guiterasi</i> (as a larva)	Peralta, 2012 Peralta, 2012 Peralta, 2012
<i>Artibeus phaeotis</i> (Miller, 1902)	<i>Vampirolepis artibeii</i> <i>Cheiropteranema globocephala</i>	García, 1986 Chitwood 1938
<i>Artibeus jamaicensis</i> Leach, 1821	<i>Vampirolepis elongatus</i> <i>Bidigiticauda vivipara</i> <i>Cheiropteranema globocephala</i> <i>Parahistiostrongylus octacanthus</i> <i>Litosomoides chitwoodi</i> <i>Litosomoides</i> sp.	García, 1995 Chitwood 1938 Chitwood, 1938 Ubelaker et al., 1979 Bain et al., 2003 García, 1995
<i>Artibeus lituratus</i> (Olfers, 1928)	<i>Bidigiticauda vivipara</i> <i>Cheiropteranema globocephala</i>	Caballero-Deloya 1971 Ubelaker et al., 1979
<i>Artibeus toltecus</i> (Saussure, 1860)	<i>Cheiropteranema globocephala</i> <i>Litosomoides brasiliensis</i>	Ubelaker et al., 1979 Bain et al, 2003
<i>Carollia perspicillata</i> (L. 1758)	<i>Cheiropteranema globocephala</i> <i>Litosomoides brasiliensis</i> <i>Litosomoides penai</i>	Ubelaker et al., 1979 Bain et al, 2003 Jiménez-Quirós and Arroyo-Sancho, 1960
<i>Desmodus rotundus</i> Geoffroy, 1810	<i>Biacantha desmoda</i> <i>Capillaria</i> sp.	García, 1995 Peralta, 2012
<i>Glossophaga soricina</i> Pallas, 1766	<i>Anenterotremata auritum</i> <i>Litosomoides hamletti</i> ; <i>Vampirolepis elongatus</i>	Lunaschi and Drago, 2011 Chitwood, 1938; Ubelaker et al., 1979
<i>Leptonycteris yerbabuenae</i> Martínez and Villa, 1940	<i>Anenterotremata auritum</i> <i>Vampirolepis elongatus</i> <i>Aonchotheca speciosa</i> <i>Litosomoides guiterasi</i> <i>Litosomoides guiterasi</i> (as a larva)	Juárez-González, pers. comm. Peralta, 2012 Juárez-González, pers. comm. Peralta, 2012 Peralta, 2012
<i>Macrotus waterhousii</i> Gray, 1843	<i>Limatulum aberrans</i> <i>Litosomoides leonilavazquezae</i> <i>Vampirolepis gertschi</i> <i>Torrestrongylus tetradorsalis</i> <i>Aonchotheca speciosa</i> <i>Spirura mexicana</i> <i>Litosomoides guiterasi</i>	Caballero and Bravo, 1950 Caballero, 1939 Galindo, 2014; Ramírez, 2015 Caspeta-Mandujano et al., 2015 Peralta, 2012 Peralta et al., 2012 Galindo, 2014
<i>Micronycteris hirsuta</i>	<i>Anenterotremata freitasi</i> <i>Limatulum isthmicus</i> <i>Castroia silvai</i> <i>Maxbraunium tubiporum</i>	Caballero, 1964 Caballero, 1964 Caballero and Montero-Gei, 1963 Caballero, 1964
<i>Micronycteris microtis</i>	<i>Anenterotremata auritum</i> <i>Capillaria</i> sp.	Stunkard, 1938 Chitwood, 1938
<i>Phyllostomus discolor</i> (Wagner, 1843)	<i>Histiostrongylus coronatus</i> <i>Histiostrongylus spinosus</i>	Ubelaker et al., 1979 Vaucher and Durette-Desset, 1999
<i>Phyllostomus hastatus</i> (Pallas, 1767)	<i>Anenterotremata stunkardi</i> <i>Histiostrongylus coronatus</i> <i>Parahistiostrongylus octacanthus</i>	Caballero and Groccott, 1960 Ubelaker et al., 1979 Ubelaker et al., 1979
<i>Trachops cirrhosus</i> Spix, 1823	<i>Tricholeiperia leiperi</i>	Chitwood, 1938

Table 3 (continued). Checklist of species of parasites recorded per bat species in Mexico and Central America

Bat Species	Helminth Species	References
Family Vespertilionidae		
<i>Lasiurus blossevillii</i> (as <i>Vespertilio lasiurus</i>)	<i>Maxbraunium tubiporum</i>	Caballero and Cerecero, 1942
<i>Lasiurus cinereus</i> Beauvois, 1796	<i>Paralecithodendrium macnabi</i>	Caballero and Zerecero, 1951
	<i>Paralecithodendrium scabrum</i>	Galindo, 2014; Ramírez, 2015
<i>Eptesicus</i> sp.	<i>Prosthodendrium cordiforme</i>	Caballero and Brenes-Madrigal, 1957
	<i>Limatulum costarricensis</i>	Caballero and Brenes-Madrigal, 1957
	<i>Urotrema scabridum</i>	Caballero et al., 1957
<i>Myotis velifer</i> Allen, 1890	<i>Anchitrema sanguineum</i>	Ramírez, 2015
	<i>Ochoterenatrema labda</i>	Ramírez, 2015
	<i>Paralecithodendrium scabrum</i>	Ramírez, 2015
	<i>Limatulum limatulum</i>	Ramírez, 2015
	<i>Tremajoannes buckleyi</i>	Ramírez, 2015
	<i>Plagiorchis vespertilionis</i>	Ramírez, 2015
	<i>Urotrema scabridum</i>	Ramírez, 2015
	<i>Vampirolepis decipiens</i>	Ramírez, 2015
	<i>Allintoshius tadaridae</i>	Ramírez, 2015
	<i>Trichuroides myoti</i>	Ramírez, 2015
	Acuariidae gen. sp. (as a larva)	Ramírez, 2015
<i>Pipistrellus hesperus</i> Allen, 1864	<i>Plagiorchis micracanthos</i>	Heddergott and Steinbach, 2015

Table 4. Records in Mexico listing species of helminths with no confirmed host identification and not considered in this checklist

Helminth	Host	State	Site of Infection	References
Nematoda				
Capillaridae	None provided	Sinaloa	—	Espericueta, 2012
Rhabditida (?)	None provided	Sinaloa	—	Espericueta, 2012
<i>Biacantha</i> sp.	<i>Desmodus rotundus</i>	Colima	Intestine	García-Márquez, 1985
<i>Capillaria</i> sp.	<i>Micronycteris megalotis mexicana</i>	Yucatán	Stomach	Chitwood, 1938
<i>Litomosoides</i> sp.	<i>Artibeus jamaicensis</i> , <i>A. intermedius</i>	Jalisco	Mesentery	García, 1995
<i>Pterothomix</i> sp.	<i>Pteronotus davyi</i>	Jalisco	Intestine	García, 1995
<i>Vampirolepis</i> sp.	<i>Tadarida brasiliensis</i>	Nuevo León, Puebla, Zacatecas	Intestine	Guzmán-Cornejo et al., 2003
<i>Vexillata</i> sp.	<i>Artibeus jamaicensis</i>	Morelos	Intestine	Eslava, 2005

Table 5. Distribution of parasites in the bat species surveyed for helminthes up to 2015

Species of parasite	Species of bat																											
	<i>Balantiopteryx plicata</i>	<i>Tadarida brasiliensis</i>	<i>Mormoops</i>	<i>Pteronotus davyi</i>	<i>Pteronotus parnellii</i>	<i>Pteronotus personatus</i>	<i>Natalus mexicanus</i>	<i>Dermanura azteca</i>	<i>Dermanura phaeotis</i>	<i>Artibeus jamaicensis</i>	<i>Artibeus lituratus</i>	<i>Dermanura tolteca</i>	<i>Carollia perspicillata</i>	<i>Desmodus rotundus</i>	<i>Glossophaga soricina</i>	<i>Leptonycteris</i>	<i>Macrotus waterhousii</i>	<i>Micronycteris hirsuta</i>	<i>Micronycteris microtis</i>	<i>Phyllostomus discolor</i>	<i>Phyllostomus hastatus</i>	<i>Trachops cirrhosus</i>	<i>Lasurus blassevillii</i>	<i>Lasurus cinereus</i>	<i>Eptesicus</i> sp.	<i>Myotis velifer</i>	<i>Parastrellus hesperus</i>	
<i>Anchitrema sanguineum</i>																										X		
<i>Anenterotrema auritum</i>			X				X								X	X			X									
<i>Anenterotrema freitasi</i>																		X										
<i>Anenterotrema stunkardi</i>																					X							
<i>Dicrocoelium rileyi</i>		X																										
<i>Platynosum beltrani</i>		X																										
<i>Castroia silvai</i>																		X										
<i>Ochoterenatrema labda</i>	X	X	X	X			X																				X	
<i>Paralecithodendrium emadillum</i>							X																					
<i>Paralecithodendrium macnabi</i>																								X				
<i>Paralecithodendrium scabrum</i>			X																					X		X		
<i>Prosthodendrium cordiforme</i>																									X			
<i>Limatulum aberrans</i>																	X											
<i>Limatulum costarricensis</i>																								X				
<i>Limatulum diminutum</i>			X	X	X	X																						
<i>Limatulum gastroides</i>	X		X	X	X	X																						
<i>Limatulum isthmicus</i>																		X										
<i>Limatulum limatulum</i>		X	X	X	X		X																			X		
<i>Limatulum oklahomense</i>			X	X	X		X																					
<i>Maxbraunium tubiporum</i>			X			X																	X					
<i>Parabascus yucatanensis</i>			X				X																					
<i>Tremajoannes buckleyi</i>																										X		
<i>Plagiorchis micracanthos</i>																											X	
<i>Plagiorchis muris</i>					X		X																					
<i>Plagiorchis vespertilionis</i>		X																								X		
<i>Urotrema scabridum</i>	X	X	X	X	X	X	X																		X	X		
<i>Vampirolepis artibeii</i>								X																				
<i>Vampirolepis decipiens</i>	X	X	X		X		X																			X		
<i>Vampirolepis elongatus</i>	X		X	X				X		X					X	X												
<i>Vampirolepis gertschi</i>			X		X												X											
<i>Allintoshius tadaridae</i>		X	X				X																			X		
<i>Biacantha desmoda</i>														X														
<i>Bigiticauda vivipara</i>										X	X																	
<i>Cheiropteronomia globocephala</i>								X	X	X	X	X																
<i>Histiostrongylus coronatus</i>																				X	X							
<i>Histiostrongylus spinosus</i>																			X									
<i>Linustrongylus pteronoti</i>			X	X	X										X													
<i>Macuahuitloides inexpectans</i>			X																									
<i>Parahistiostrongylus octacanthus</i>										X											X							
<i>Tadaridanema delicatus</i>		X																										
<i>Torrestrongylus tetradorsalis</i>																	X											
<i>Tricholeiperia carneiensis</i>			X				X																					
<i>Tricholeiperia leiperi</i>																						X						
<i>Tricholeiperia pearsei</i>							X																					
<i>Websterinema parnelli</i>				X	X																							
<i>Aonchotheca martinezi</i>							X																					
<i>Aonchotheca speciosa</i>							X	X							X	X	X											
<i>Capillaria palmata</i>		X																										
<i>Capillaria</i> sp.														X				X										
<i>Pterothominx</i> sp.			X	X	X																							
<i>Trichuroides myoti</i>	X																									X		
<i>Litomosoides brasiliensis</i>												X	X															
<i>Litomosoides chitwoodi</i>										X																		
<i>Litomosoides fosteri</i>															X													
<i>Litomosoides guiterasi</i>			X		X			X							X	X	X											
<i>Litomosoides hamletti</i>															X													
<i>Litomosoides leonilavazquezae</i>																	X											
<i>Litomosoides penai</i>													X															
<i>Litomosoides</i> sp.										X																		
<i>Physaloptera</i> sp. (as a larva)			X																									
<i>Spirura mexicana</i>			X	X	X	X											X											
Spiroceridae																												
<i>Physocephalus sexalatus</i> (as a larva)	X			X	X										X				X									
<i>Pterygodermatites</i> (<i>Pterygodermatites</i>) <i>mexicana</i>	X																											
<i>Rictularia nana</i>	X																											
<i>Seuratium cancellatum</i>							X																					
Acuariidae gen. sp. (as a larva)	X	X	X		X																							
Nematoda gen. sp. (as a larva)	X	X	X																									

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